| | |
|---|---|
| **Nemko Test Report:** | 4L0619RUS1REV1 |
| **Applicant:** | Navini Networks<br>2240 Campbell Creek Blvd. Suite 110<br>Richardson, TX 75082 |
| **Equipment Under Test: (E.U.T.)** | 2500-2686 MHz PCMCIA MODEM |
| **In Accordance With:** | **FCC PART 27, Subpart M**<br>Broadband Radio Service and Educational Broadband Service |
| **Tested By:** | Nemko Dallas Inc.<br>802 N. Kealy<br>Lewisville, Texas 75057-3136 |
| **Authorized By:** |  <br>Dustin Oaks, Engineer |
| **Date:** | May 17, 2005 |

# Table of Contents

## Section 1. Summary of Test Results

Manufacturer: Navini Networks

Model No.: 2500-2686 MHz PCMCIA MODEM

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 27, Subpart M.

☒ 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. NONE

## Summary Of Test Data

| NAME OF TEST | PARA. NO. | SPEC. LIMIT | RESULT |
|---|---|---|---|
| RF Power Output | 2.1046 | 33 dBW + 10log(X/Y) dBW | Complies |
| Occupied Bandwidth | 2.1049 | 5.5 MHz | Complies |
| Spurious Emissions @ Antenna Terminals | 2.1051 | -13 dBm | Complies |
| Field Strength of Spurious Radiation | 2.1053 | -13 dBm | Complies |
| Frequency Stability | 2.1055 | Must remain within authorized bandwidth | Complies |

## Footnotes:

X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition

## Section 2. General Equipment Specification

| | |
|---|---|
| **Power Supply** | 120 Vac |
| **Frequency Range (See note below):** | 2500.5 to 2685.5 MHz |

**Type(s) of Modulation:**

| F3E (Voice) | F1D | F2D | D7W (QAM) | F9W |
|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☒ |

| | |
|---|---|
| **Emission Designator:** | 2M00F9W |
| **Output Impedance:** | 50 ohms |
| **RF Power Output:** | 25 dBm Conducted |
| EIRP F: | 32.9 dBm (1.927Watts) |
| EIRP STICK: | 33.0 dBm (2. Watts) |
| EIRP EXTERNAL: | 33.1 dBm (2.032 Watts) |
| **Duty Cycle:** | 50% TDD |
| **Selection Of Operating Frequency:** | Not selectable by operator |
| **Power Output Adjustment Capability:** | Not selectable by operator |

## Description of EUT

Navini's Wireless Modem is a sleek end-user wireless terminal device used to give the user access to Navini's wireless broadband network.

## System Diagram

Refer to separate exhibit.

## Section 3. RF Power Output

| | |
|---|---|
| NAME OF TEST: RF Power Output | PARA. NO.: 2.1046 |
| TESTED BY: Kevin Rose | DATE: 4/21/05 |

**Test Results:** Complies

**Measurement Data:** See Tables.

**MAX RF POWER OUTPUT**

| Freq | Power (dBm) | Power (Watts) |
|---|---|---|
| Low | 25.07 | .3214 |
| Mid | 25.1 | .3236 |
| High | 25.12 | .3251 |

**RF POWER at mask edges**

| Freq | Power (dBm) | Power (Watts) |
|---|---|---|
| Low | 22.9 | .195 |
| Mid | 23.25 | .211 |
| High | 23.04 | .201 |

Note:
Power is reduced at mask edges to comply with mask requirements, see mask plots for details.

## Test Data – EIRP

Nemko Dallas, Inc.

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

### Carrier EIRP

Page 1 of 1 Complete X

Specification: PT27 Temperature(°C): 23
Tested By: Kevin Rose Relative Humidity(%) 49
E.U.T.: PCMCIA modem
Configuration: TX OMNI
Sample No: 1
Location: lab 2 RBW: REF PLOT Measurement
Detector Type: peak VBW: REF PLOT Distance: 3 m

**Test Equipment Used**

Antenna: 1304 Directional Coupler: #REF!
Pre-Amp: Cable #1: 1485
Filter: Cable #2: #REF!
Receiver: 1464 Cable #3: 1042
Attenuator #1 Cable #4: 1042
Attenuator #2: Mixer: #N/A
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/-1.7 dB

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBi) | | EIRP (dBm) | EIRP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | F Antenna |
| 2502 | -26.0 | 35.6 | | 0 | 10.1 | | 19.7 | 92.90 | V | |
| 2502 | -30.3 | 34.6 | | 0 | 8.0 | | 12.3 | 16.90 | H | |
| 2590 | -25.3 | 35.6 | | 0 | 10.1 | | 20.4 | 109.14 | V | |
| 2590 | -30.3 | 34.6 | | 0 | 8.0 | | 12.3 | 16.90 | H | |
| 2683 | -23.2 | 35.6 | | 0 | 10.1 | | 22.5 | 178.24 | V | |
| 2683 | -32.8 | 34.6 | | 0 | 8.0 | | 9.8 | 9.51 | H | |
| | | | | | | | | | | STICK Antenna |
| 2502 | -13.1 | 35.6 | | 0 | 10.1 | | 32.6 | 1811.34 | V | |
| 2502 | -25.5 | 34.6 | | 0 | 8.0 | | 17.1 | 51.05 | H | |
| 2590 | -12.7 | 35.6 | | 0 | 10.1 | | 33.0 | 1999.86 | V | |
| 2590 | -23.7 | 34.6 | | 0 | 8.0 | | 18.9 | 77.80 | H | |
| 2683 | -12.9 | 35.6 | | 0 | 10.1 | | 32.8 | 1896.71 | V | |
| 2683 | -24.3 | 34.6 | | 0 | 8.0 | | 18.3 | 67.30 | H | |
| | | | | | | | | | | EXTERNAL Antenna |
| 2502 | -13.0 | 35.6 | | 0 | 10.1 | | 32.7 | 1853.53 | V | |
| 2502 | -26.2 | 34.6 | | 0 | 8.0 | | 16.4 | 43.75 | H | |
| 2590 | -12.6 | 35.6 | | 0 | 10.1 | | 33.1 | 2032.36 | V | |
| 2590 | -26.3 | 34.6 | | 0 | 8.0 | | 16.3 | 42.17 | H | |
| 2683 | -13.4 | 35.6 | | 0 | 10.1 | | 32.3 | 1690.44 | V | |
| 2683 | -29.2 | 34.6 | | 0 | 8.0 | | 13.4 | 21.93 | H | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**Notes:**

## Section 4. Occupied Bandwidth

| | |
|---|---|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 2.1049 |
| TESTED BY: Kevin Rose | DATE: 4/21/05 |

**Test Results:** Complies

**Measurement Data:** See attached plots.

## Test Data – Occupied Bandwidth

Nemko Dallas, Inc.

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

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

Page 1 of 1 Complete X

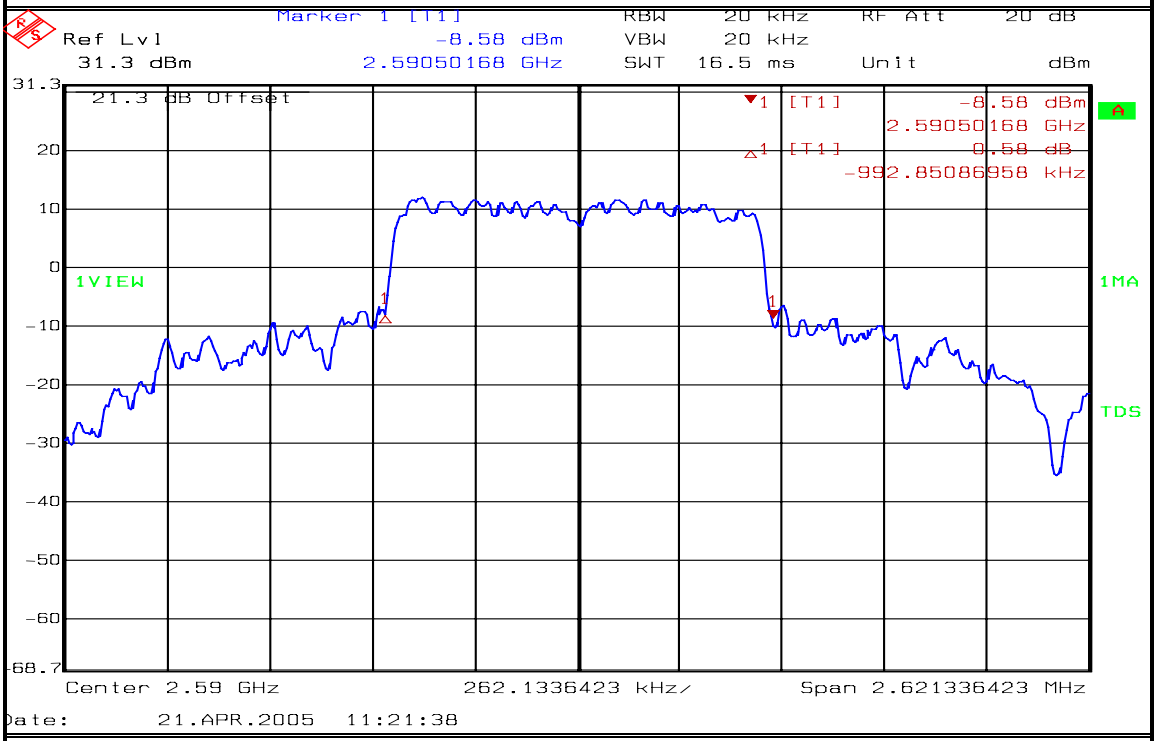
| | | | | | |
|---|---|---|---|---|---|
| Job No.: | 4L0619 | Date: | 4/21/2005 | Preliminary: | |
| Specification: | PT27 | Temperature(°C): | 23 | | |
| Tested By: | Kevin Rose | Relative Humidity(%) | 49 | | |
| E.U.T.: | PCMCIA | | | | |
| Configuration: | TX | | | | |
| Sample Number: | | | | | |
| Location: | Lab 1 | RBW: | 20 | Measurement | |
| Detector Type: | Rms | VBW: | Refer to plots | Distance: | NA m |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | |
| Filter: | | Cable #2: | 1082 |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | | Cable #4: | |
| Attenuator #2: | 1477 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB




Notes:

## Section 5. Spurious Emissions at Antenna Terminals

| | |
|---|---|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 2.1051 |
| TESTED BY: Kevin Rose | DATE: 4/21/05 |

**Test Results:** Complies

**Measurement Data:** See attached plots.

## Test Data – Spurious Emissions at Antenna Terminals

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

**Data Plot** **Spurious Emissions at Antenna Terminals**

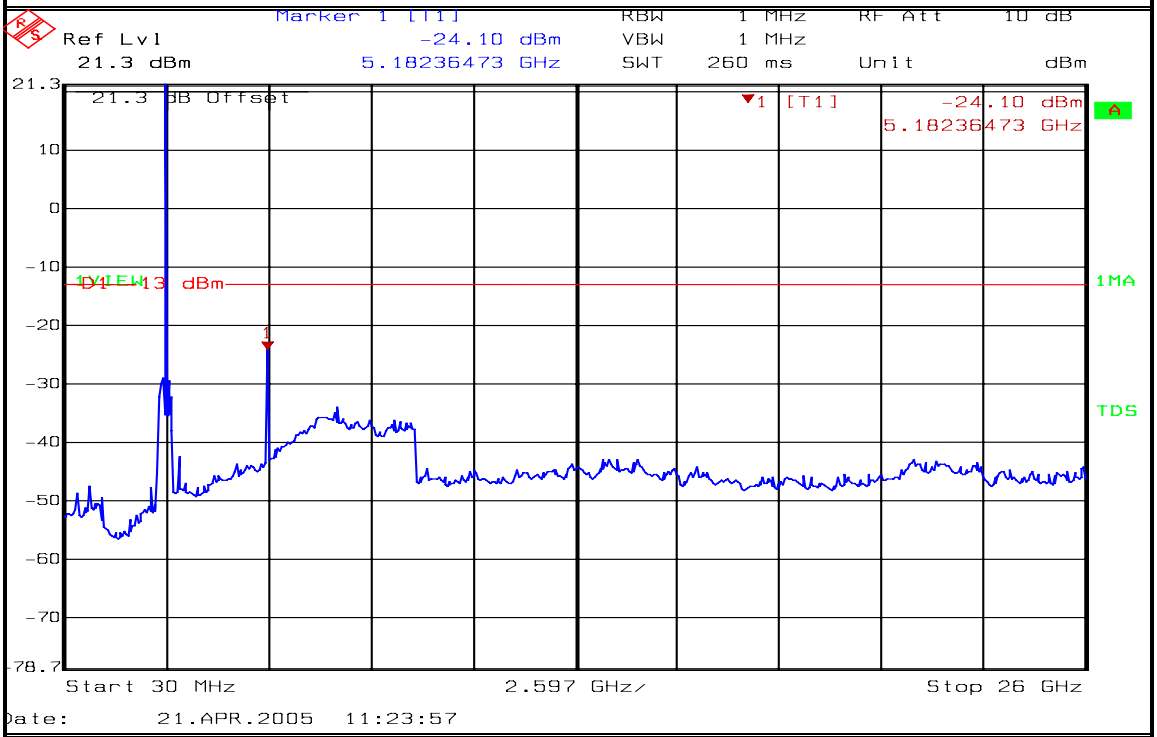
Page 1 of 2 Complete X

| | | | | | |
|---|---|---|---|---|---|
| Job No.: | 4L0619 | Date: | 4/21/05 | Preliminary: | |
| Specification: | PT27 | Temperature(°C): | 20 | | |
| Tested By: | Kevin Rose | Relative Humidity(%) | 35 | | |
| E.U.T.: | pcmcia modem | | | | |
| Configuration: | TX | | | | |
| Sample Number: | 1 | | | | |
| Location: | Lab 1 | RBW: | Refer to plots | Measurement | |
| Detector Type: | Peak | VBW: | Refer to plots | Distance: | NA m |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | |
| Filter: | | Cable #2: | 1082 |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | 1472 | Cable #4: | |
| Attenuator #2: | | Mixer: | |

Additional equipment used:
Measurement Uncertainty: +/-1.7 dB



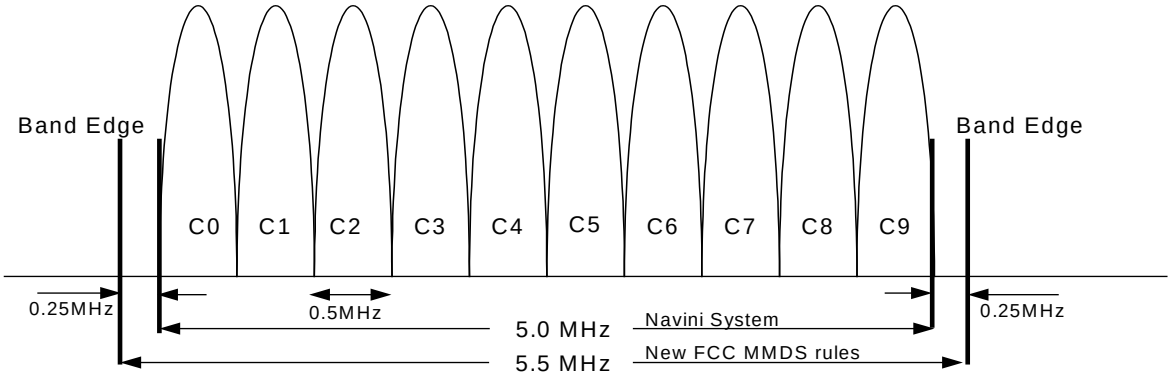

Notes:

**The spectrum was searched in detail. The plot shown is representative of the noise floor readings found**

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

### Explanation of Testing Method

The Navini networks system is comprised of a BTS which occupies 5 MHz of spectrum, a CPE which occupies 2MHz, and a PCMCIA card which occupies 1 MHz. Since the channels are spaced at 5.5MHz that leaves .25 MHz of guard band on both the upper and lower edges of the Channel for the BTS. Within the 5 MHz of spectrum which the BTS occupies we have ten 500 KHz carriers (please see figure below). Of these ten carriers the PCMCIA will use only 2 carriers.
When the PCMCIA occupies carriers C0, and C1 , or carriers C8, and C9 the power at the antenna port is 23 dBm avg. To show compliance the mask is reduced from 5.5 MHz wide to 1.5 MHz wide. By placing the signal in the center of this mask we are able to show compliance to both the upper and lower edges of the channel. If however the PCMCIA occupies any two carriers from C2 to C7 then the power at the antenna port is increased to 35dBm avg. In this case the mask is increased to 3.5 MHz. In doing so we show compliance to both the upper and lower edges of the Channel with a 1.25Mhz guard band at both edges.




**10-Carrier BTS Signal Operating in a 5 MHz Band**

## Mask Center (Conducted Power at 25dBm)

Nemko Dallas, Inc.

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

**Data Plot** **Spurious Emissions at Antenna Terminals**

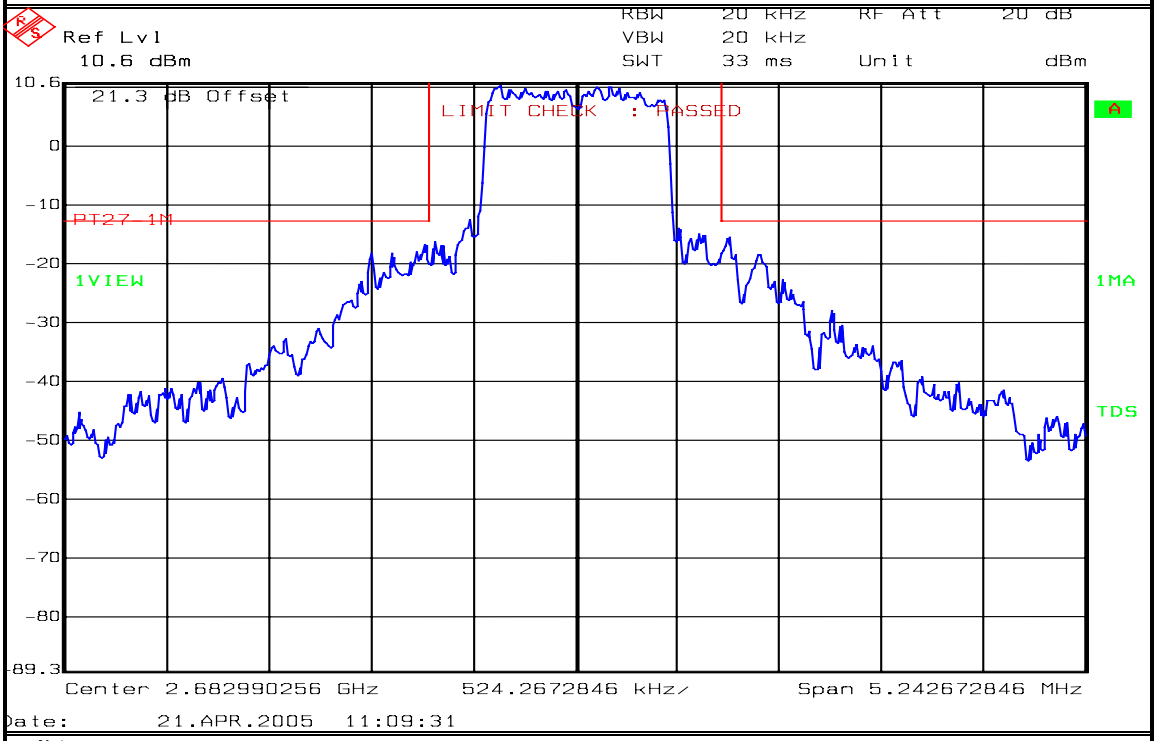
Page 1 of 2 Complete X

| | | | | | |
|---|---|---|---|---|---|
| Job No.: | 4L0619 | Date: | 4/21/05 | Preliminary: | |
| Specification: | PT27 | Temperature(°C): | 20 | | |
| Tested By: | Kevin Rose | Relative Humidity(%) | 35 | | |
| E.U.T.: | pcmcia modem | | | | |
| Configuration: | TX | | | | |
| Sample Number: | 1 | | | | |
| Location: | Lab 1 | RBW: | Refer to plots | Measurement | |
| Detector Type: | Peak | VBW: | Refer to plots | Distance: | NA m |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | |
| Filter: | | Cable #2: | 1082 |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | 1472 | Cable #4: | |
| Attenuator #2: | | Mixer: | |

Additional equipment used:
Measurement Uncertainty: +/-1.7 dB




**Notes:**

**The spectrum was searched in detail. The plot shown is representative of the noise floor readings found**

## Mask Edges (Conducted Power at 23dBm)

Nemko Dallas, Inc.

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

**Data Plot** **Spurious Emissions at Antenna Terminals**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 4L0619 | Date: | 4/21/2005 |
| Specification: | PT27 | Temperature(°C): | 20 |
| Tested By: | Kevin Rose | Relative Humidity(%) | 35 |
| E.U.T.: | pcmcia modem | | |
| Configuration: | TX | | |


Notes:

## Section 6. Field Strength of Spurious

| | |
|---|---|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 2.1053 |
| TESTED BY: Kevin Rose | DATE: 4/21/05 |

**Test Results:** Complies

**Measurement Data:** See attached table.

## Test Data - Radiated Emissions

Nemko Dallas, Inc.

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

### Field Strength of Spurious Emissions

Page 1 of 1 Complete X
Job No.: 4L0618 Date: 4/21/2005 Preliminary
Specification: PT27 Temperature(°C): 23
Tested By: Kevin Rose Relative Humidity(%) 49
E.U.T.: PCMCIA
Configuration: TX F Antenna
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

**Test Equipment Used**

Antenna: 1480 Directional Coupler:
Pre-Amp: 1016 Cable #1: 1484
Filter: 1482 Cable #2: 1485
Receiver: 1464 Cable #3:
Attenuator #1 Cable #4:
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/- 1.7 dB

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBi) | | EIRP (dBm) | EIRP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tx @ 2590 MHz |
| | | | | | | | | | | F Antenna |
| 5180 | -53.7 | 40.6 | | 32.3 | 11.2 | | -34.2 | 0.00 | V | |
| 7770 | -54.5 | 40.4 | | 32.9 | 11.6 | | -35.4 | 0.00 | V | |
| 10360 | -61.7 | 41.0 | | 34.7 | 12.7 | | -42.8 | 0.00 | V | |
| 12950 | -63.8 | 44.5 | | 33.7 | 13.8 | | -39.1 | 0.00 | V | NF |
| 15600 | -63.7 | 43.2 | | 32.2 | 15.8 | | -36.9 | 0.00 | V | NF |
| 18200 | -63.3 | 53.1 | | 34 | 8.6 | | -35.7 | 0.00 | V | NF |
| 5180 | -57.0 | 36.3 | | 32.3 | 9.1 | | -44.0 | 0.00 | H | |
| 7770 | -59.2 | 39.8 | | 32.9 | 9.4 | | -42.9 | 0.00 | H | |
| 10360 | -61.2 | 42.5 | | 34.7 | 10.5 | | -42.9 | 0.00 | H | |
| 12950 | -64.5 | 47.5 | | 33.7 | 11.7 | | -39.0 | 0.00 | H | NF |
| 15540 | -66.5 | 44.0 | | 32.2 | 13.6 | | -41.1 | 0.00 | H | NF |
| 18200 | -65.8 | 54.6 | | 34 | 6.4 | | -38.8 | 0.00 | H | NF |

Nemko Dallas, Inc.

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

## Field Strength of Spurious Emissions

Page 1 of 1 Complete X

Job No.: 4L0619 Date: 4/21/2005 Preliminary

Specification: PT27 Temperature(°C): 23

Tested By: Kevin Rose Relative Humidity(%) 49

E.U.T.: PCMCIA

Configuration: TX EXTERNAL Antenna

Sample No: 1

Location: AC 3 RBW: 1 MHz Measurement

Detector Type: Peak VBW: 1 MHz Distance: 3 m

**Test Equipment Used**

Antenna: 1480 Directional Coupler:

Pre-Amp: 1016 Cable #1: 1484

Filter: 1482 Cable #2: 1485

Receiver: 1464 Cable #3:

Attenuator #1 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/- 1.7 dB

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBi) | | EIRP (dBm) | EIRP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tx @ 2590 MHz |
| | | | | | | | | | | EXTERNAL Antenna |
| 5180 | -46.8 | 40.6 | | 32.3 | 11.2 | | -27.3 | 0.00 | V | |
| 7770 | -54.2 | 40.4 | | 32.9 | 11.6 | | -35.1 | 0.00 | V | |
| 10360 | -61.2 | 41.0 | | 34.7 | 12.7 | | -42.3 | 0.00 | V | |
| 12950 | -62.7 | 44.5 | | 33.7 | 13.8 | | -38.0 | 0.00 | V | NF |
| 15600 | -63.8 | 43.2 | | 32.2 | 15.8 | | -37.0 | 0.00 | V | NF |
| 18200 | -62.7 | 53.1 | | 34 | 8.6 | | -35.1 | 0.00 | V | NF |
| 5180 | -50.8 | 36.3 | | 32.3 | 9.1 | | -37.8 | 0.00 | H | |
| 7770 | -56.3 | 39.8 | | 32.9 | 9.4 | | -40.0 | 0.00 | H | |
| 10360 | -61.8 | 42.5 | | 34.7 | 10.5 | | -43.5 | 0.00 | H | |
| 12950 | -62.7 | 47.5 | | 33.7 | 11.7 | | -37.2 | 0.00 | H | NF |
| 15540 | -63.2 | 44.0 | | 32.2 | 13.6 | | -37.8 | 0.00 | H | NF |
| 18200 | -64.0 | 54.6 | | 34 | 6.4 | | -37.0 | 0.00 | H | NF |

## Test Data - Radiated Emissions

Nemko Dallas, Inc.

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

### Field Strength of Spurious Emissions

Page 1 of 1 Complete X
Job No.: 4L0619 Date: 4/21/2005 Preliminary
Specification: PT27 Temperature(°C): 23
Tested By: Kevin Rose Relative Humidity(%) 49
E.U.T.: PCMCIA
Configuration: TX STICK Antenna
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

**Test Equipment Used**

Antenna: 1480 Directional Coupler:
Pre-Amp: 1016 Cable #1: 1484
Filter: 1482 Cable #2: 1485
Receiver: 1464 Cable #3:
Attenuator #1 Cable #4:
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/- 1.7 dB

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBi) | | EIRP (dBm) | EIRP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tx @ 2590 MHz |
| | | | | | | | | | | STICK Antenna |
| 5180 | -55.3 | 40.6 | | 32.3 | 11.2 | | -35.8 | 0.00 | V | |
| 7770 | -52.3 | 40.4 | | 32.9 | 11.6 | | -33.2 | 0.00 | V | |
| 10360 | -62.3 | 41.0 | | 34.7 | 12.7 | | -43.4 | 0.00 | V | |
| 12950 | -64.2 | 44.5 | | 33.7 | 13.8 | | -39.5 | 0.00 | V | NF |
| 15600 | -64.2 | 43.2 | | 32.2 | 15.8 | | -37.4 | 0.00 | V | NF |
| 18200 | -61.5 | 53.1 | | 34 | 8.6 | | -33.9 | 0.00 | V | NF |
| 5180 | -58.2 | 36.3 | | 32.3 | 9.1 | | -45.2 | 0.00 | H | |
| 7770 | -56.7 | 39.8 | | 32.9 | 9.4 | | -40.4 | 0.00 | H | |
| 10360 | -61.2 | 42.5 | | 34.7 | 10.5 | | -42.9 | 0.00 | H | |
| 12950 | -64.7 | 47.5 | | 33.7 | 11.7 | | -39.2 | 0.00 | H | NF |
| 15540 | -65.2 | 44.0 | | 32.2 | 13.6 | | -39.8 | 0.00 | H | NF |
| 18200 | -64.3 | 54.6 | | 34 | 6.4 | | -37.3 | 0.00 | H | NF |

The spectrum was searched from 30 MHz to the 10th harmonic of the carrier.

## Photos – Radiated Emissions

## Section 7. Frequency Stability

| | |
|---|---|
| NAME OF TEST: Frequency Stability | PARA. NO.: 2.1055 |
| TESTED BY: Kevin Rose | DATE: 4/21/05 |

**Test Results:** Complies

**Measurement Data:** See attached plots.

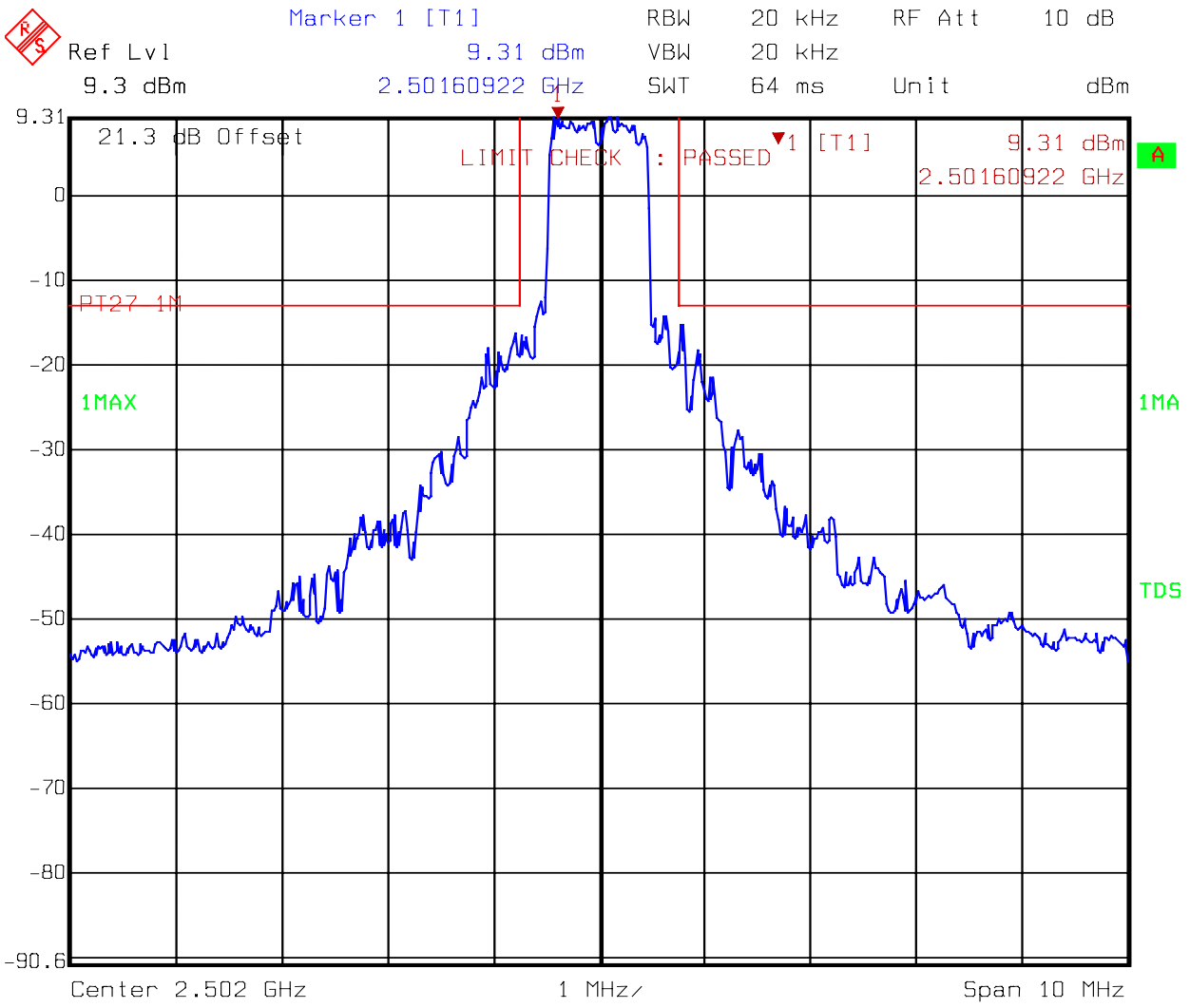
**Test Equipment Used:** 1036-1469-1474-1625-283-619

**Standard Supply Voltage:** 120 Vac

**Environmental Conditions:** 20 °Celsius
50 % RH

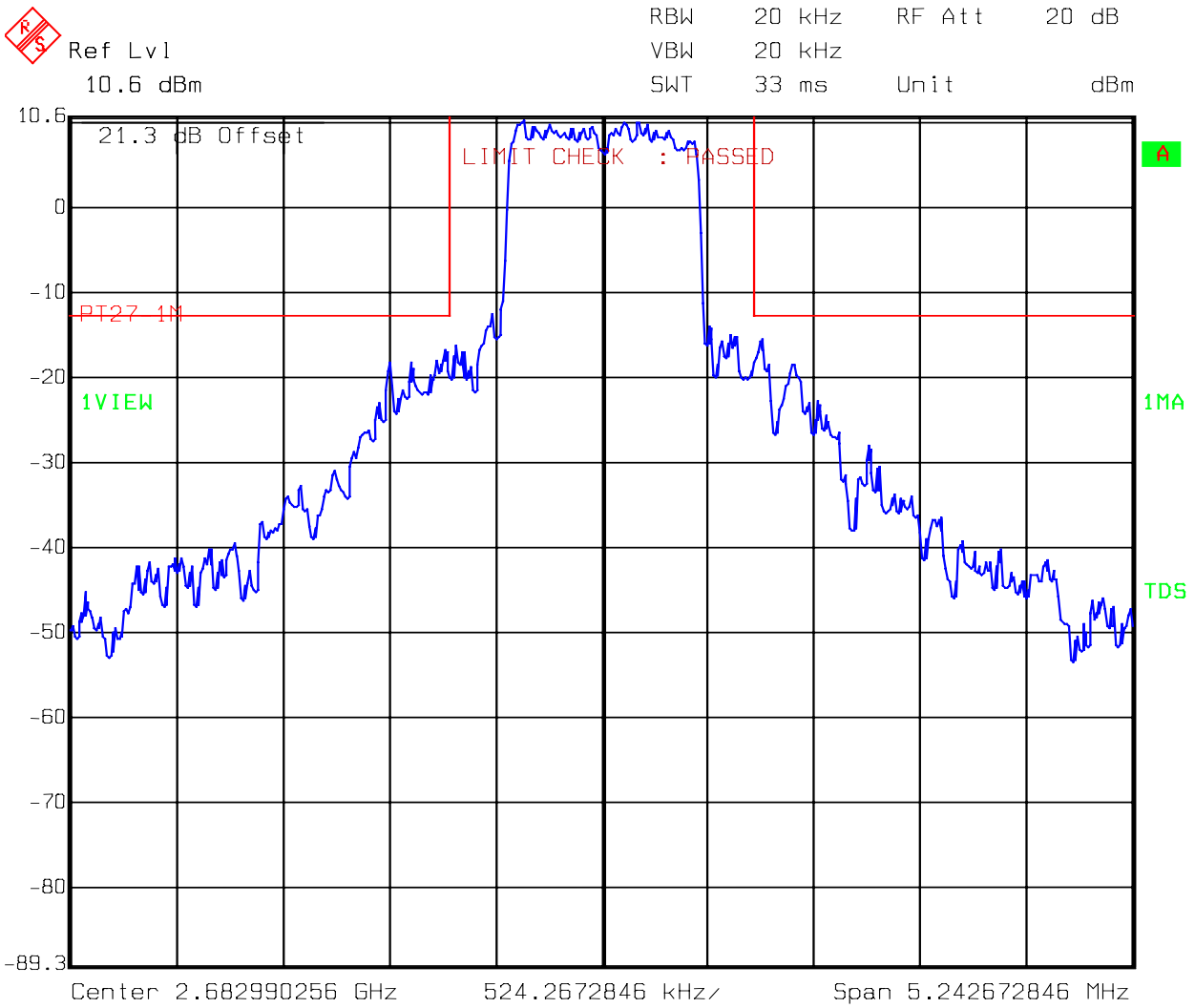
## Test Data – Frequency Stability

+20 C / 102 Vac



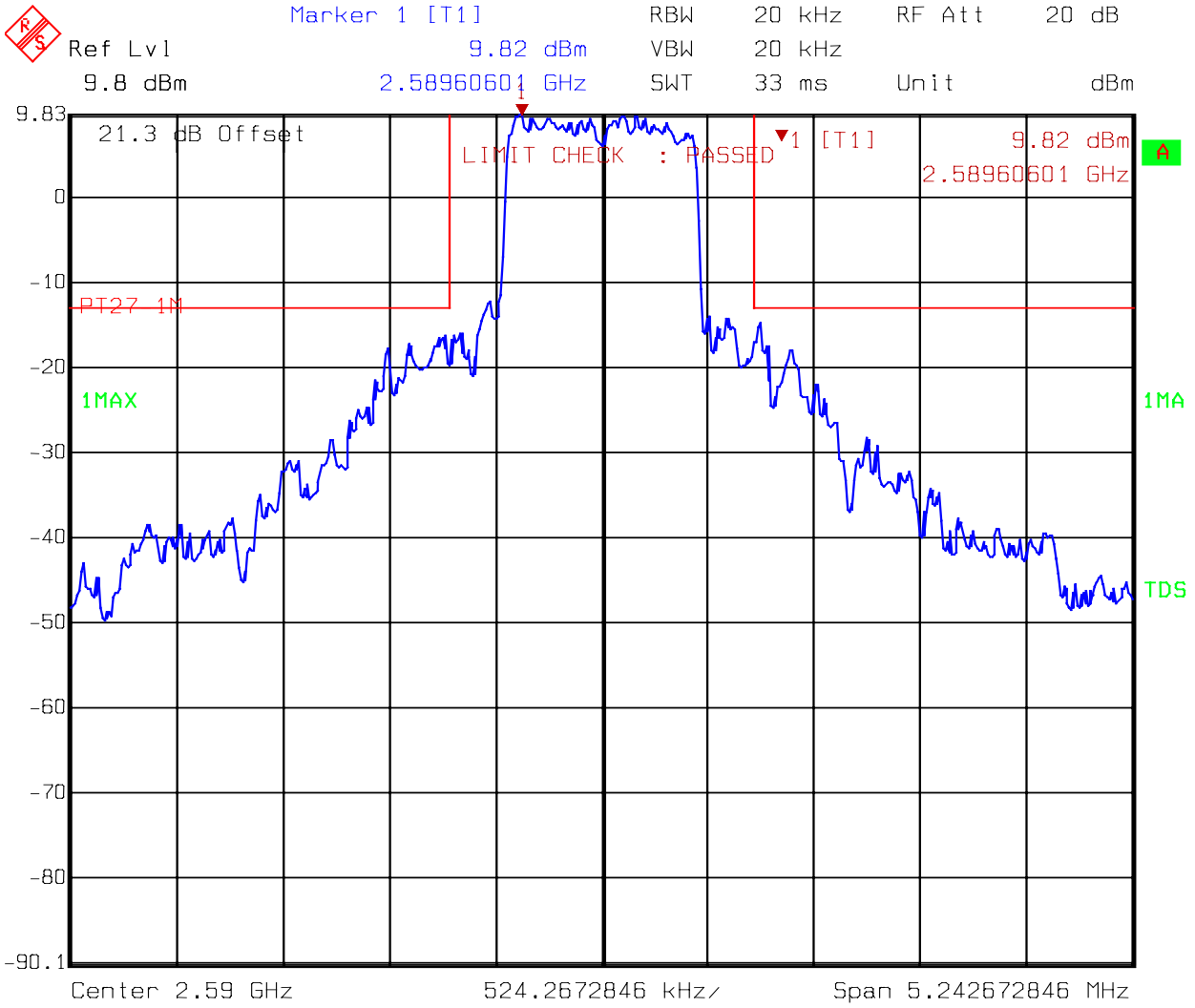
## Test Data – Frequency Stability

+20 C/ 138 Vac



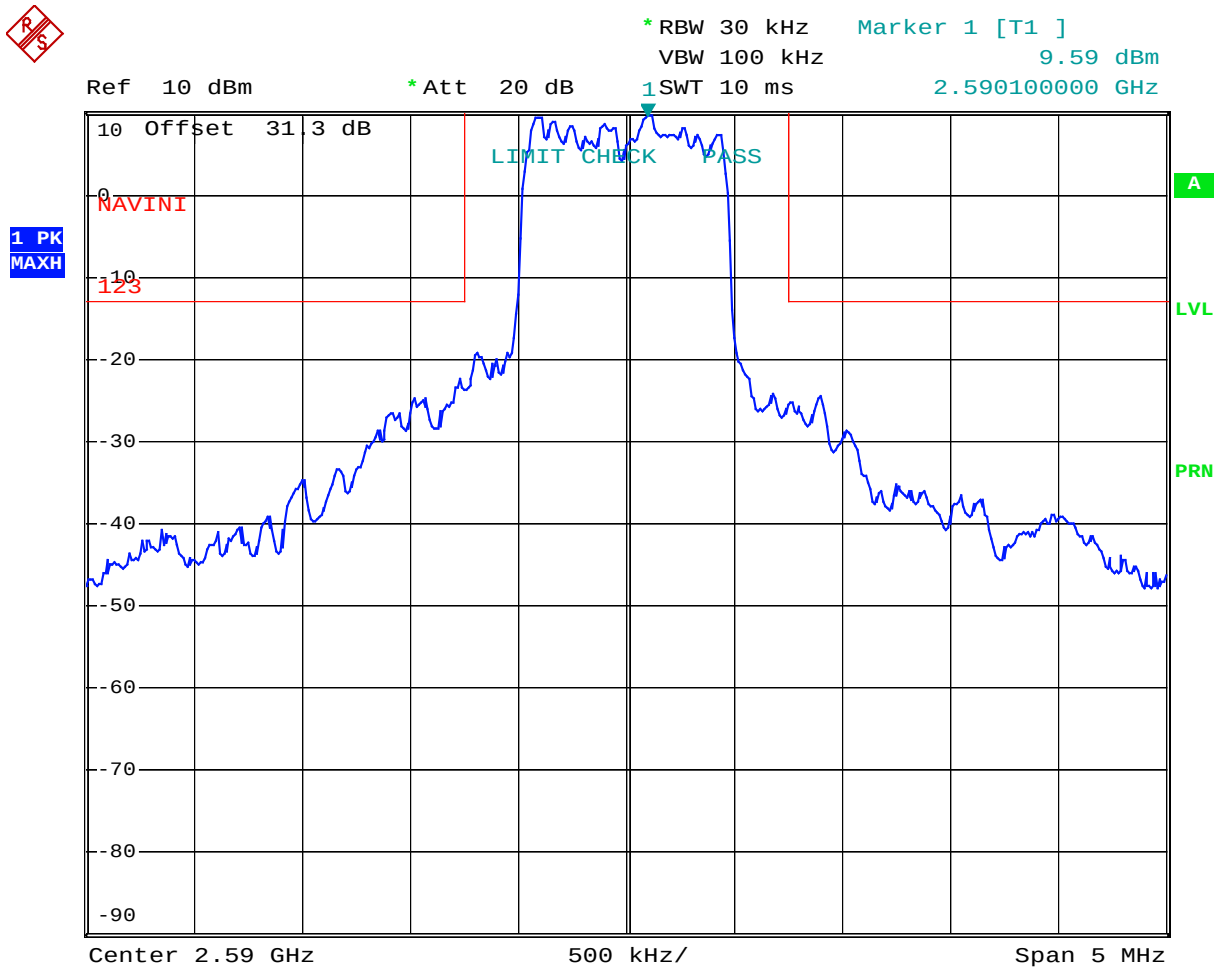
## Test Data – Frequency Stability

+20 C / 120 Vac



Test Data – Frequency Stability

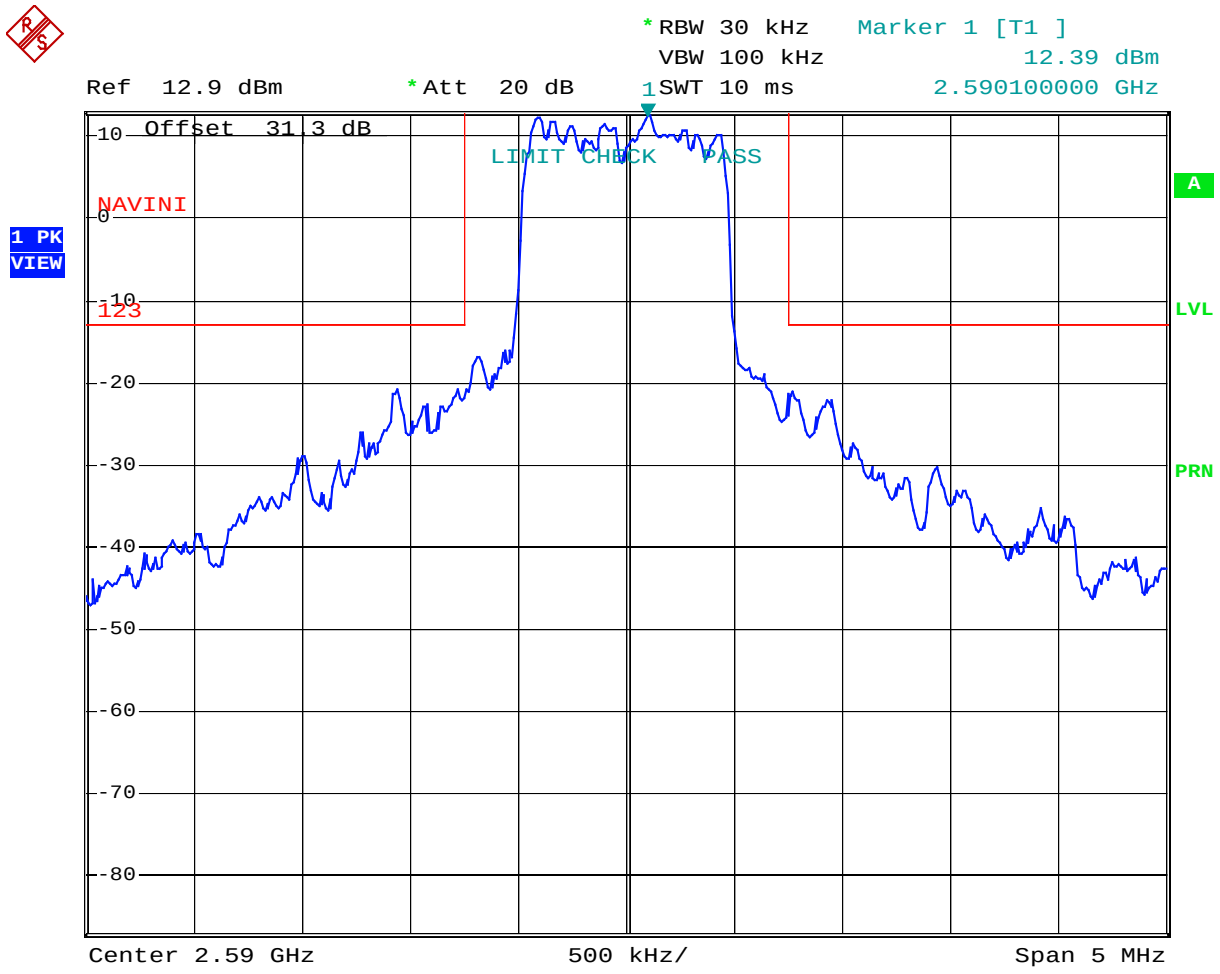
+50 C




Date: 22.APR.2005 12:47:13

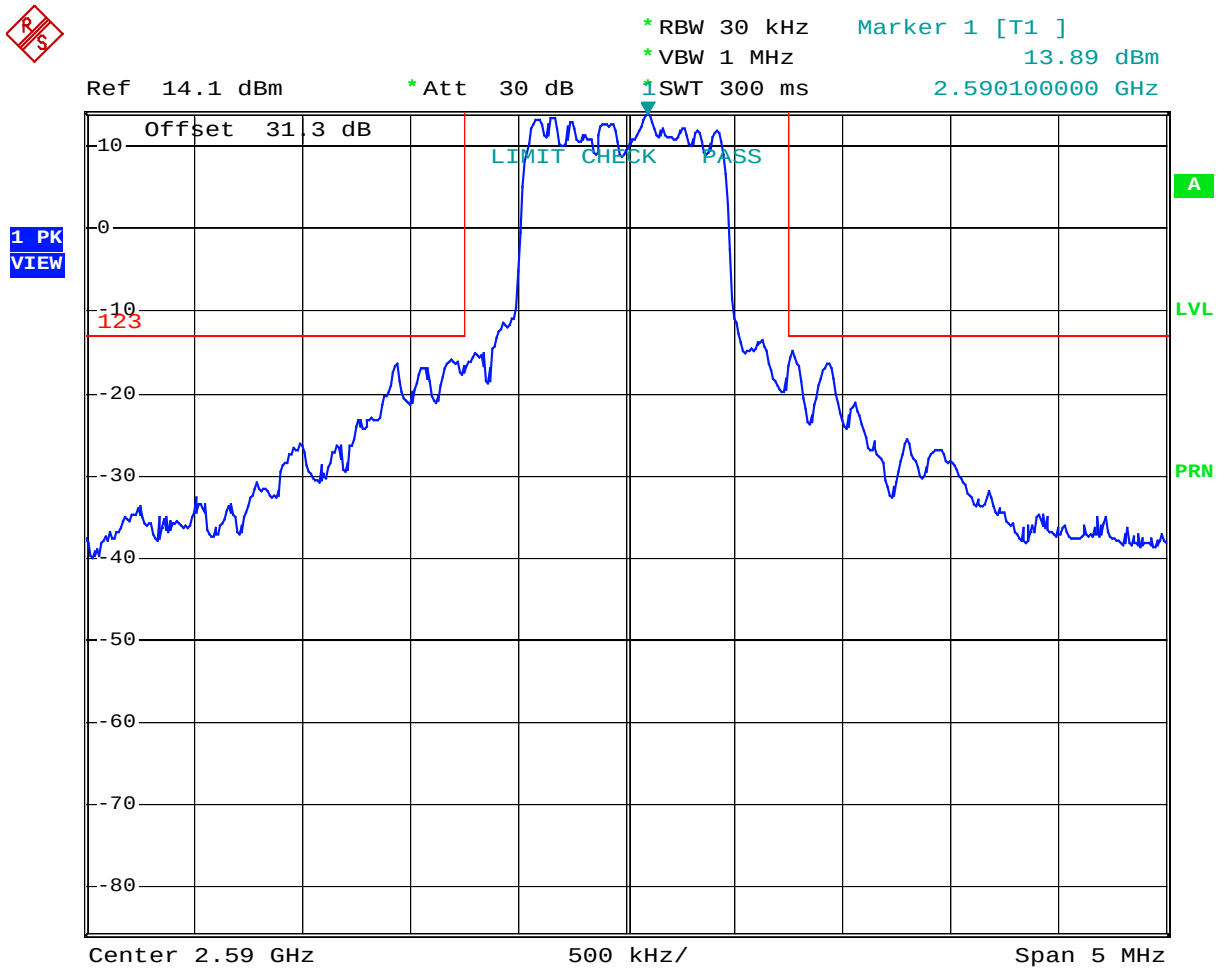
## Test Data – Frequency Stability

+40 C



## Test Data – Frequency Stability

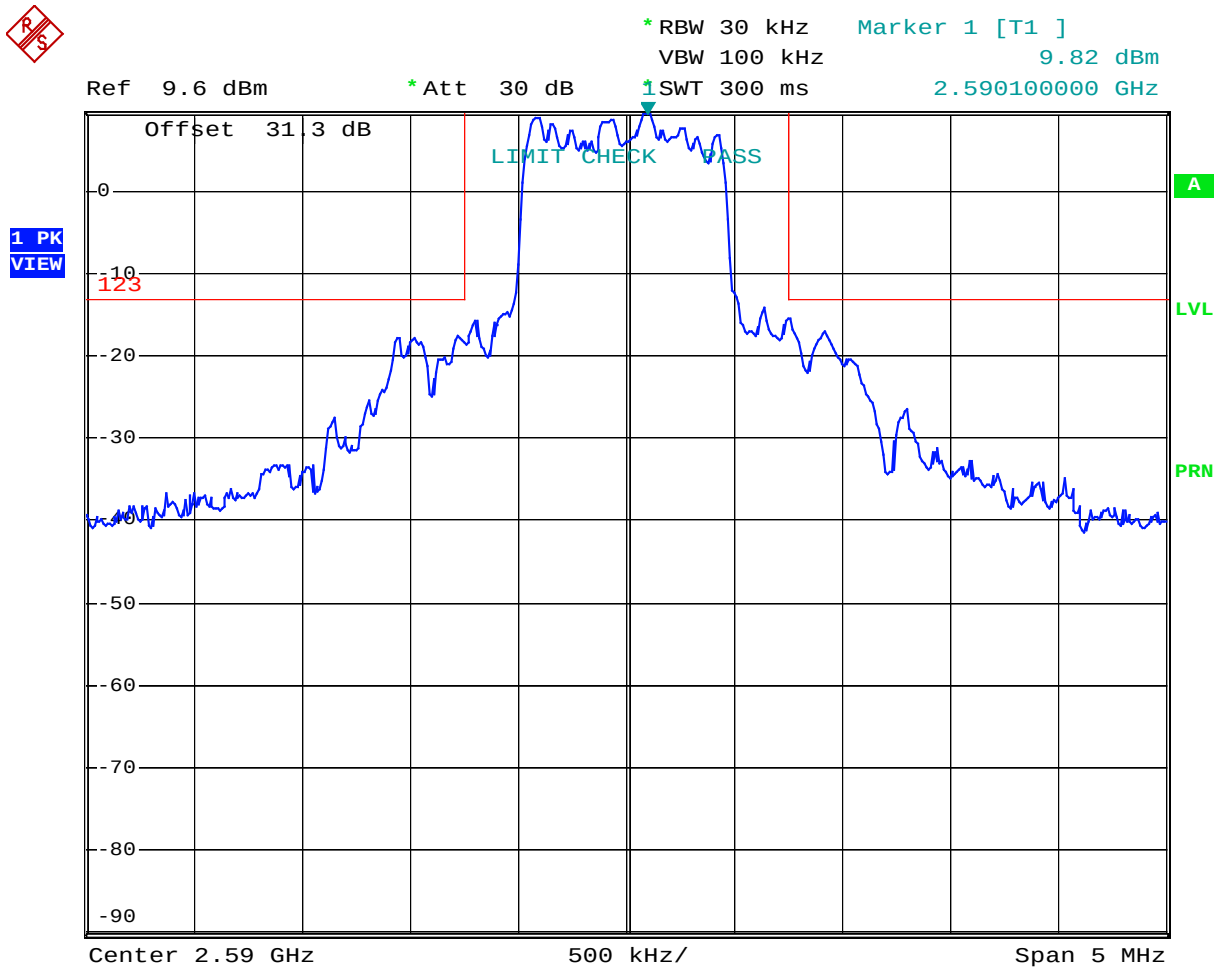
+30 C




Date: 22.APR.2005 15:04:24

## Test Data – Frequency Stability

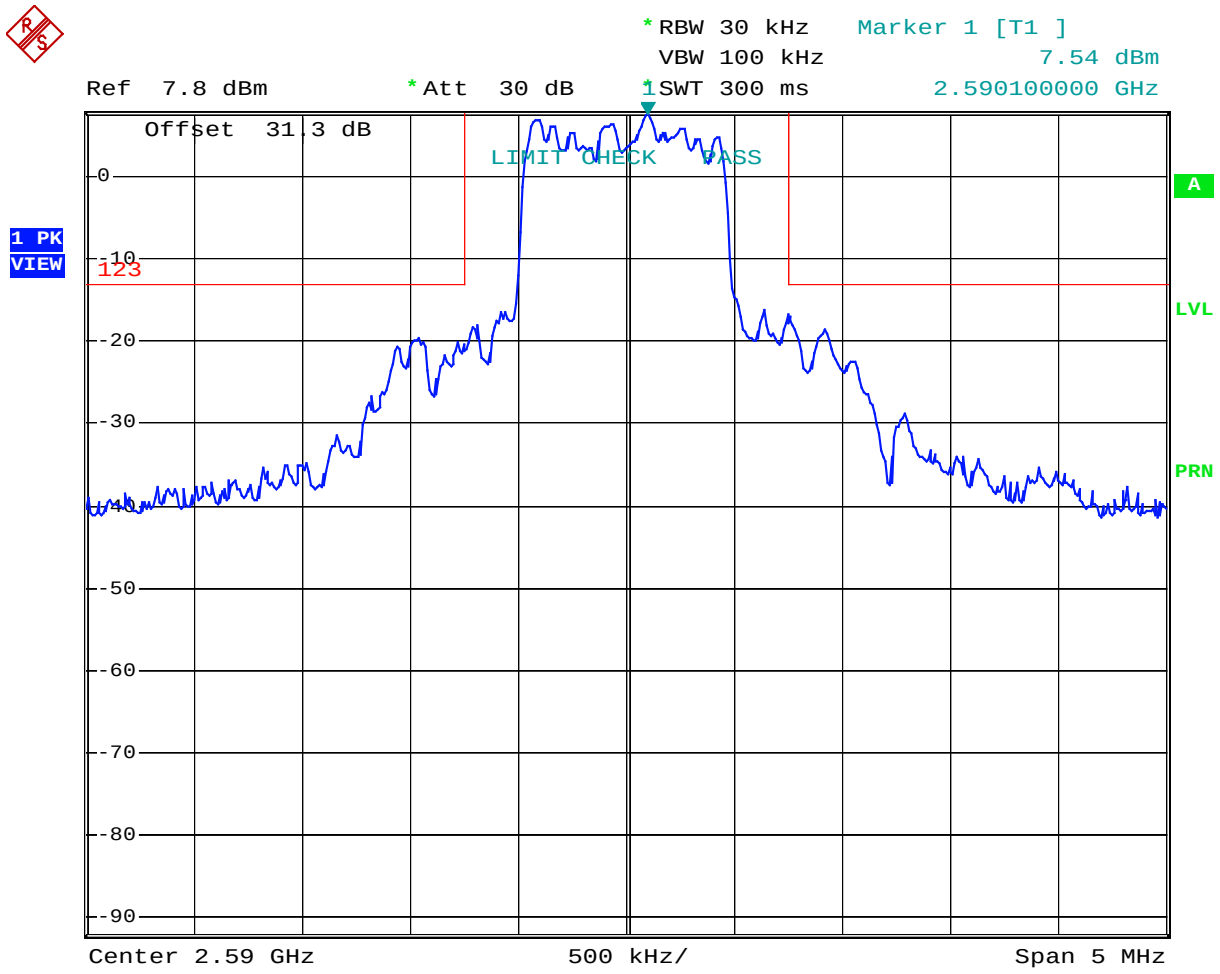
10 C




Date: 22.APR.2005 18:27:13

## Test Data – Frequency Stability

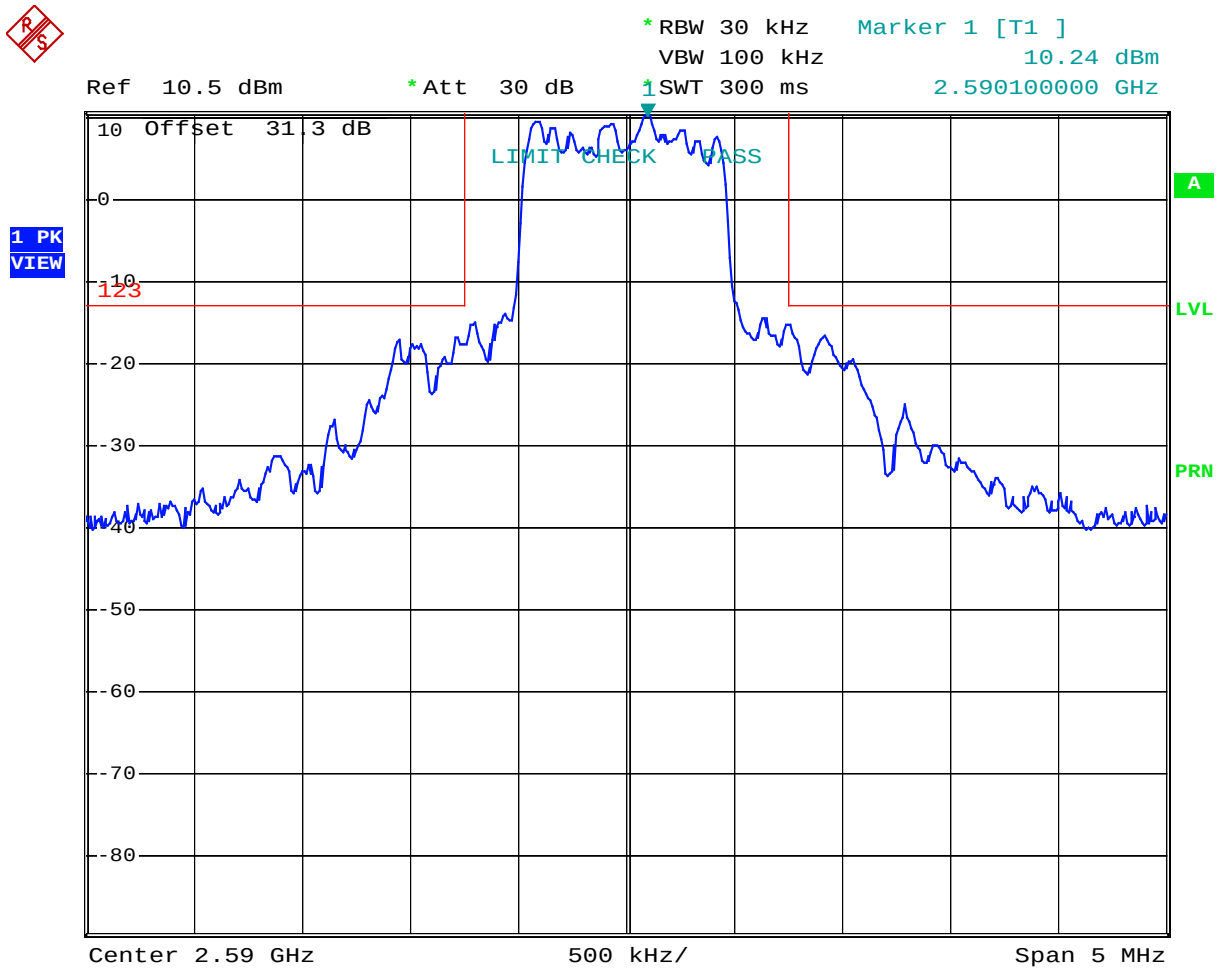
0 C




Date: 22.APR.2005 17:40:00

## Test Data – Frequency Stability

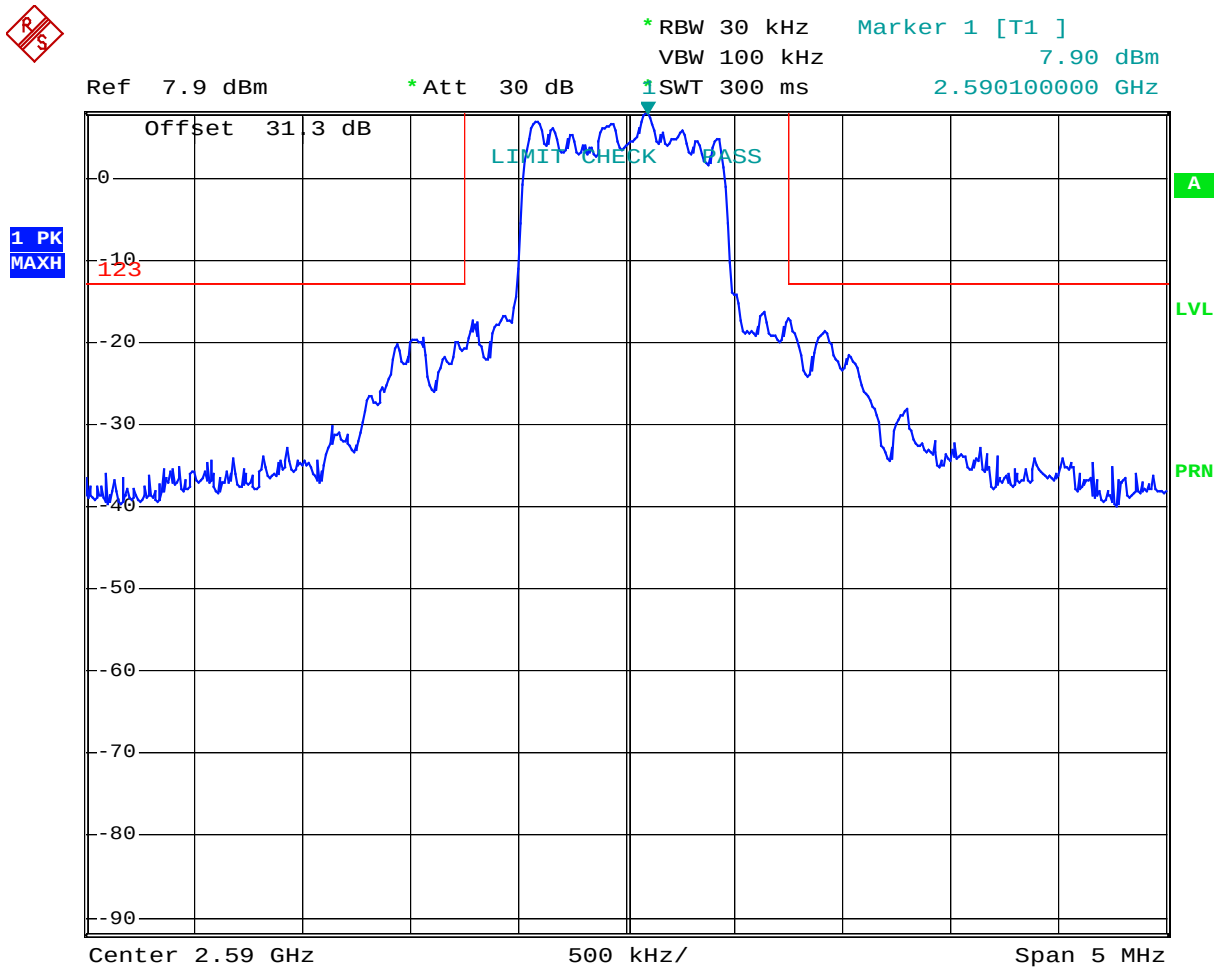
-10 C




Date: 22.APR.2005 17:54:45

## Test Data – Frequency Stability

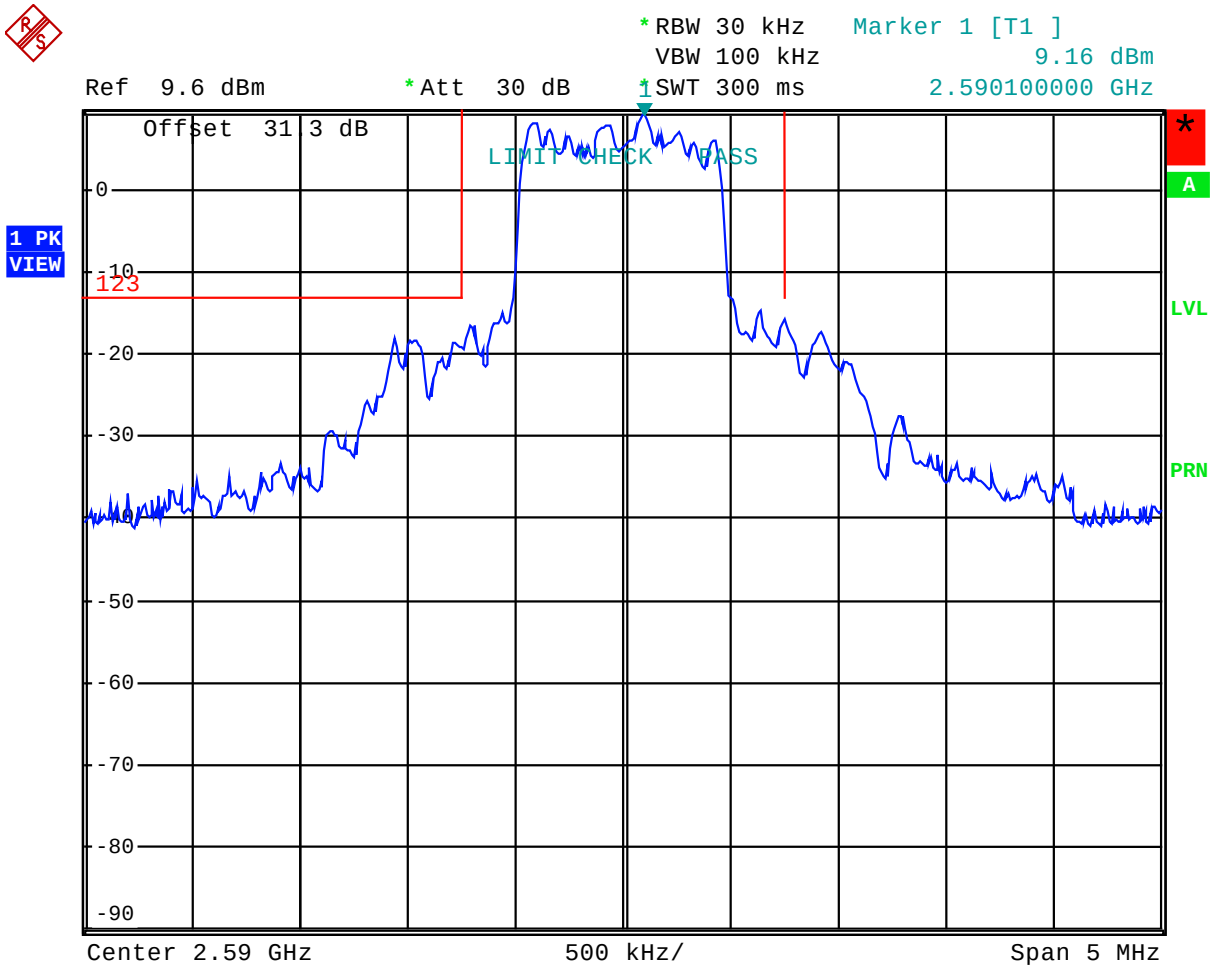
-20 C




Date: 22.APR.2005 18:04:13

## Test Data – Frequency Stability

-30 C



# Section 8. Test Equipment List

| Nemko ID | Description | Manufacturer Model Number | Serial Number | Calibration Date | Calibration Due |
|---|---|---|---|---|---|
| 1004 | CABLE, .6m | KTL RG223 | N/A | 02/18/00 | N/A |
| 1082 | CABLE 2m | Astrolab 32027-2-29094-72TC | N/A | CBU | N/A |
| 1477 | 20db Attenuator DC 18 Ghz | MCL Inc. BW-S20W5 | NONE | CBU | N/A |
| 1484 | Cable 2.0-18.0 Ghz | Storm PR90-010-072 | N/A | 08/26/04 | 08/26/05 |
| 1485 | Cable 2.0-18.0 Ghz | Storm PR90-010-216 | N/A | 08/02/04 | 08/02/05 |
| 1016 | Pre-Amp | HEWLETT PACKARD 8449A | 2749A00159 | 11/12/04 | 11/12/05 |
| 1482 | Band Pass Filter | K & L 11SH10-4000/T12000-0/0 | 2 | Cal B4 Use | N/A |
| 1464 | Spectrum analyzer | Hewlett Packard 8563E | 3551A04428 | 07/30/04 | 07/31/06 |
| 1304 | HORN ANTENNA | ELECTRO METRICS RGA-60 | 6151 | 09/22/03 | 09/22/05 |
| 1016 | Pre-Amp | HEWLETT PACKARD 8449A | 2749A00159 | 11/12/04 | 11/12/05 |
| 283 | Environmental Chamber with controller # 1189006 | ENVIROTRONICS SH27 & 2030-22844 | 129010083 | 04/22/03 | 04/21/04 |
| 619 | THERMOMETER | FLUKE 51 | 4520028 | 09/16/04 | 09/16/05 |
| 1469 | 10 db Attenuator DC 18 Ghz | MCL Inc. BW-S10W2 10db-2WDC | NONE | CBU | N/A |
| 1474 | 20db Attenuator DC 18 Ghz | MCL Inc. BW-S20W2 | NONE | CBU | N/A |
| 1036 | SPECTRUM ANALYZER | ROHDE & SCHWARZ FSEK30 | 830844/006 | 03/22/04 | 03/23/06 |
| 791 | PREAMP, 25dB | ICC LNA25 | 398 | 11/12/04 | 11/12/05 |
| 760 | Antenna biconical | Electro Metrics MFC-25 | 477 | 06/22/04 | 06/22/05 |
| 759 | ANTENNA, LOG PERIODIC | A.H. SYSTEMS SAS-200/510 | 556 | 07/23/04 | 07/23/05 |

# ANNEX A - TEST DETAILS

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

**Method Of Measurement:**

**Antenna Conducted:**
The peak power at antenna terminals is measured using a Spectrum Analyzer or Power Meter. Power output is measured with the maximum rated input level.

**E.I.R.P.:**
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.: 2.1049** |
|---|---|

**Method Of Measurement:**

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1% of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate bandwidth mask is applied to the output waveform to verify compliance.

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

**Antenna Conducted:**

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of 1 MHz for emissions above 1 GHz. Below 1 GHz the resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate limit line is applied to the output waveform to verify compliance.

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

**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 an isotropic.. 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 eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic.

**NAME OF TEST: Frequency Stability 2.1055**

**Method Of Measurement:**

**Frequency Stability With Voltage Variation:**

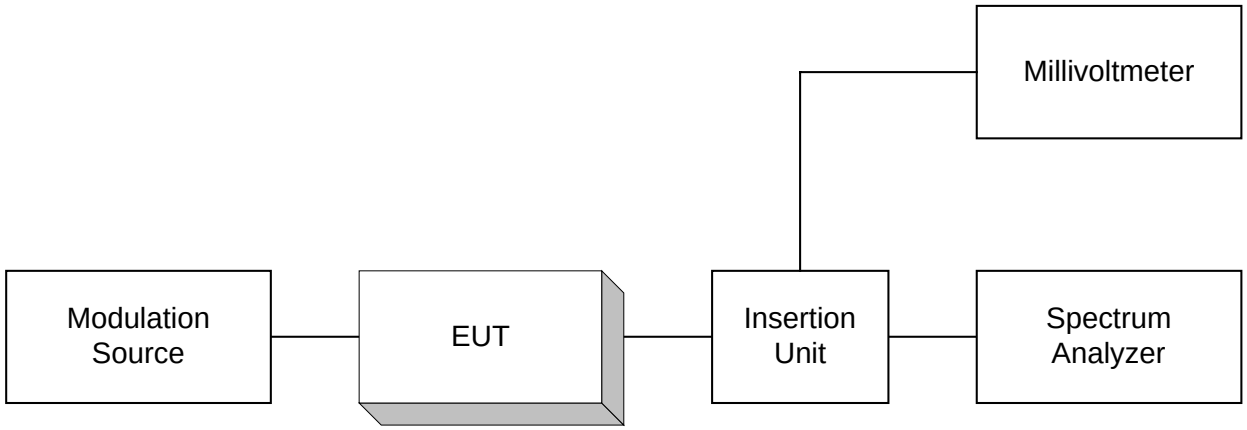
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

**Frequency Stability With Temperature Variation:**

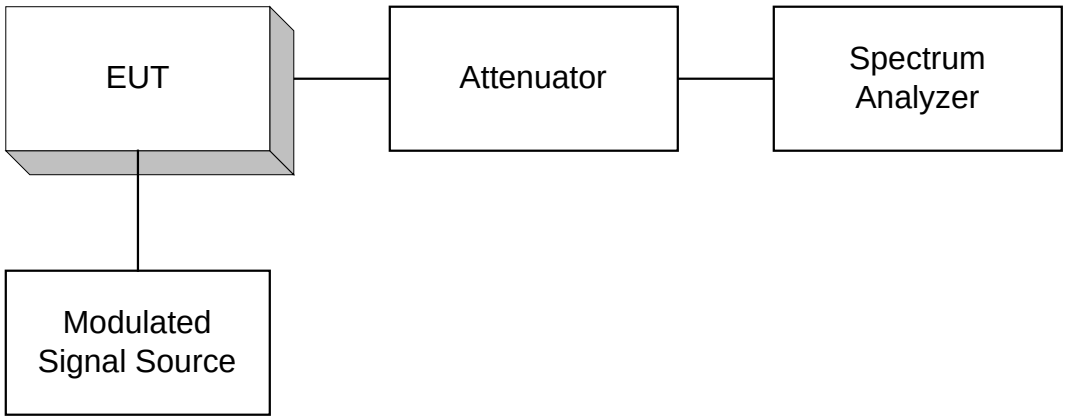
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

# ANNEX B - TEST DIAGRAMS

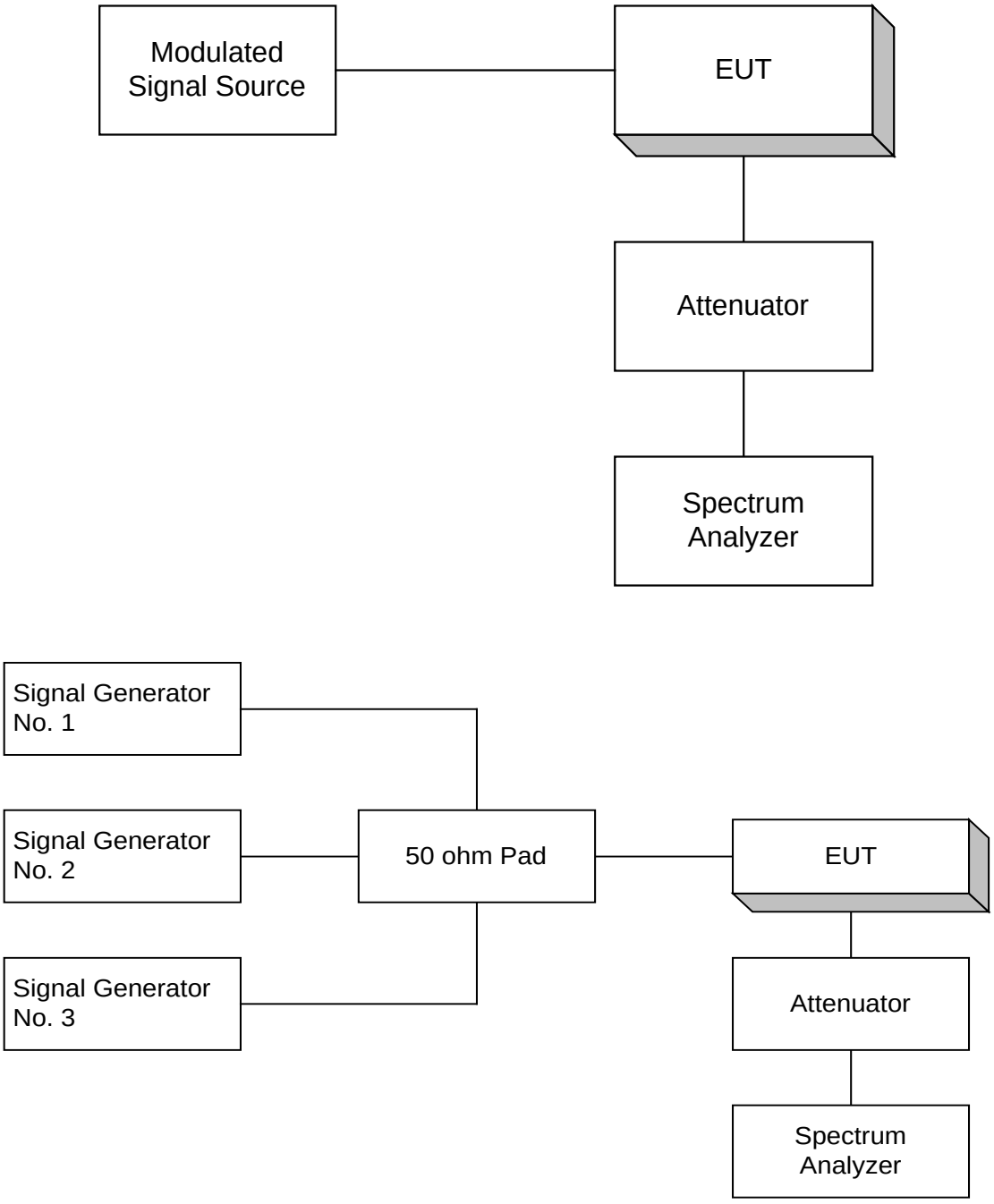
**Para. No. 2.1046 - R.F. Power Output**



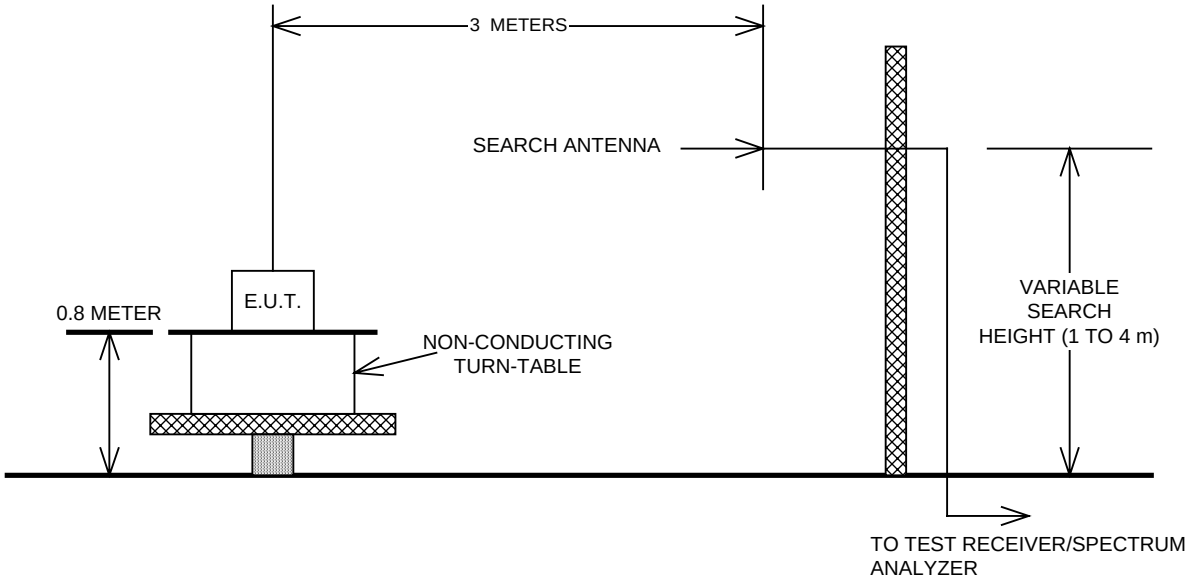

**Para. No. 2.1049 - Occupied Bandwidth**



**Para. No. 2.1051 - Spurious Emissions at Antenna Terminals**



## Para. No. 2.1053 - Field Strength of Radiation




## Para. No. 2.1055 - Frequency Stability