| | |
|---|---|
| **Nemko Test Report:** | 4L0362RUS1Rev1 |
| **Applicant:** | Andrew Corporation<br>2601 Telecom Parkway<br>Richardson, Texas 75082 |
| **Equipment Under Test: (E.U.T.)** | E/O Transceiver Amp 800 |
| **In Accordance With:** | **FCC Part 90, Subpart I**<br>Transmitter |
| **Tested By:** | Nemko USA Inc.<br>802 N. Kealy<br>Lewisville, TX 75057-3136 |
| **Authorized By:** |  <br>Tom Tidwell, Frontline Group Manager |
| **Date:** | 20-May-05 |

# Table of Contents

## Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: E/O Transceiver Amp 800

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 90, Subpart I.

☒ 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. | MEAS. | RESULT |
|---|---|---|---|---|
| RF Power Output | 90.205 | | | Complies |
| Audio Frequency Response | TIA EIA-603.3.2.6 | N/A | N/A | N/A |
| Audio Low-Pass Filter Response | TIA EIA-603.3.2.6 | N/A | N/A | N/A |
| Modulation Limiting | TIA EIA-603.3.2.6 | N/A | N/A | N/A |
| Occupied Bandwidth | 90.210 | Plots | Plots | Complies |
| Spurious Emissions at Antenna Terminals | 90.210 | Plots | Plots | Complies |
| Field Strength of Spurious Emissions | 90.210 | | | Complies |
| Frequency Stability | 90.213 | | | Complies |
| Transient Frequency Behavior | 90.214 | N/A | N/A | N/A |

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

(1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
(2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.

.

# Section 2. General Equipment Specification

## Transmitter

**Supply Voltage Input:** 120 Vac

**Frequency Range:** 866-869 MHz

**Tunable Bands:** 866-869 MHz

**Type(s) of Modulation:**

| F3E (Voice) | F1D | F2D | D7W (QAM) | C4FM (G9D) |
|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☒ |

**Emission Designator:** 9K25G9D

**Gain:** 48 dB

**Output Impedance:** 50 Ohms

**RF Power Output (rated):**

| | |
|---|---|
| **Single:** | 30 dBm (1 Watt) |
| **2 Carriers** | 28.8 dBm (780.6 mW) – 25.8 dBm per carrier |
| **8 Carriers** | 25.8 dBm (380.2 mW) – 16.8 dBm per carrier |
| **16 Carriers** | 23.1 dBm (204.2 mW) – 11.1 dBm per carrier |

**Channel Spacing(s):** 12.5 kHz

**Frequency Translation:**

| F1-F1 | F1-F2 | N/A |
|---|---|---|
| ☒ | ☐ | ☐ |

**Band Selection:**

| Software | Duplexer Change | Fullband Coverage |
|---|---|---|
| ☐ | ☐ | ☒ |

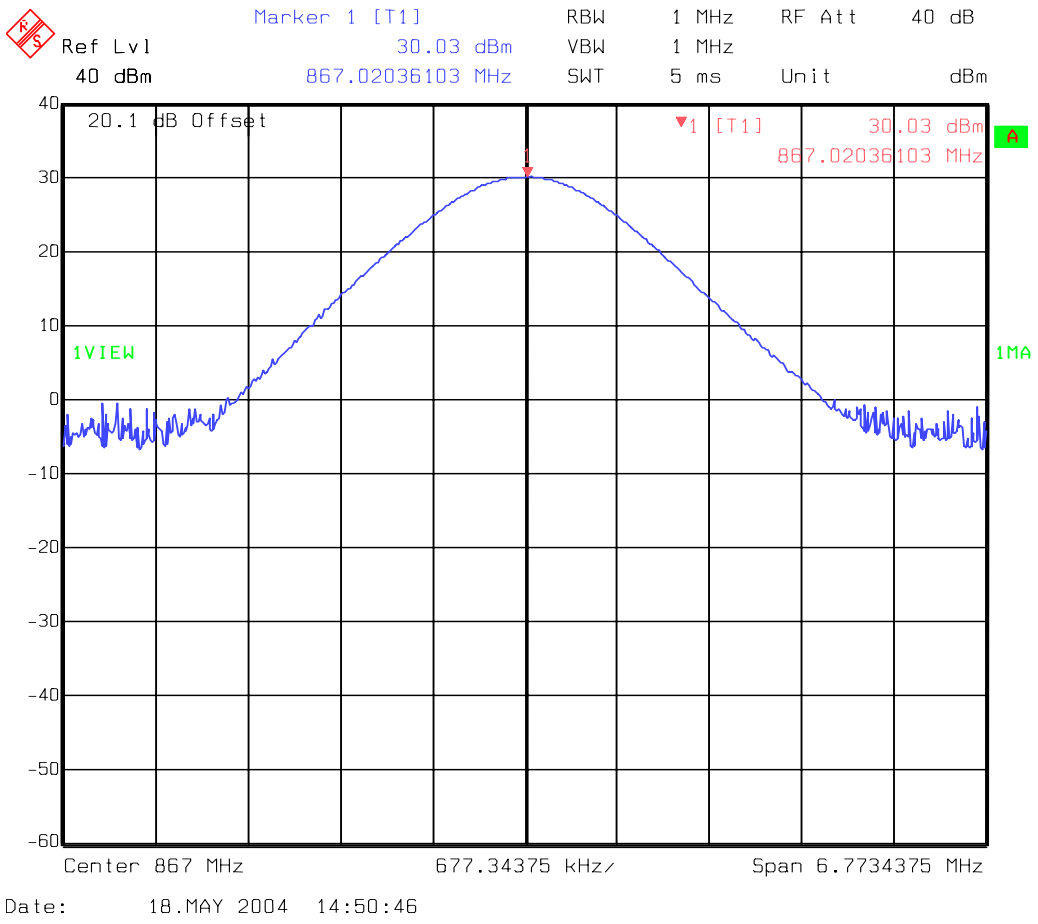
**Description of EUT:** Fiber based amplifier

## Section 3. RF Power Output

| | |
|---|---|
| NAME OF TEST: RF Power Output | PARA. NO.: 2.985 |
| TESTED BY: David Light | DATE: 5/18/04 |

**Test Results:** Complies.

**Measurement Data:**




**Test Equipment Used:** 1036-1604-1629-1627

**Test Conditions:** 22$^{O}$C / 40% RH

## Section 4. Occupied Bandwidth

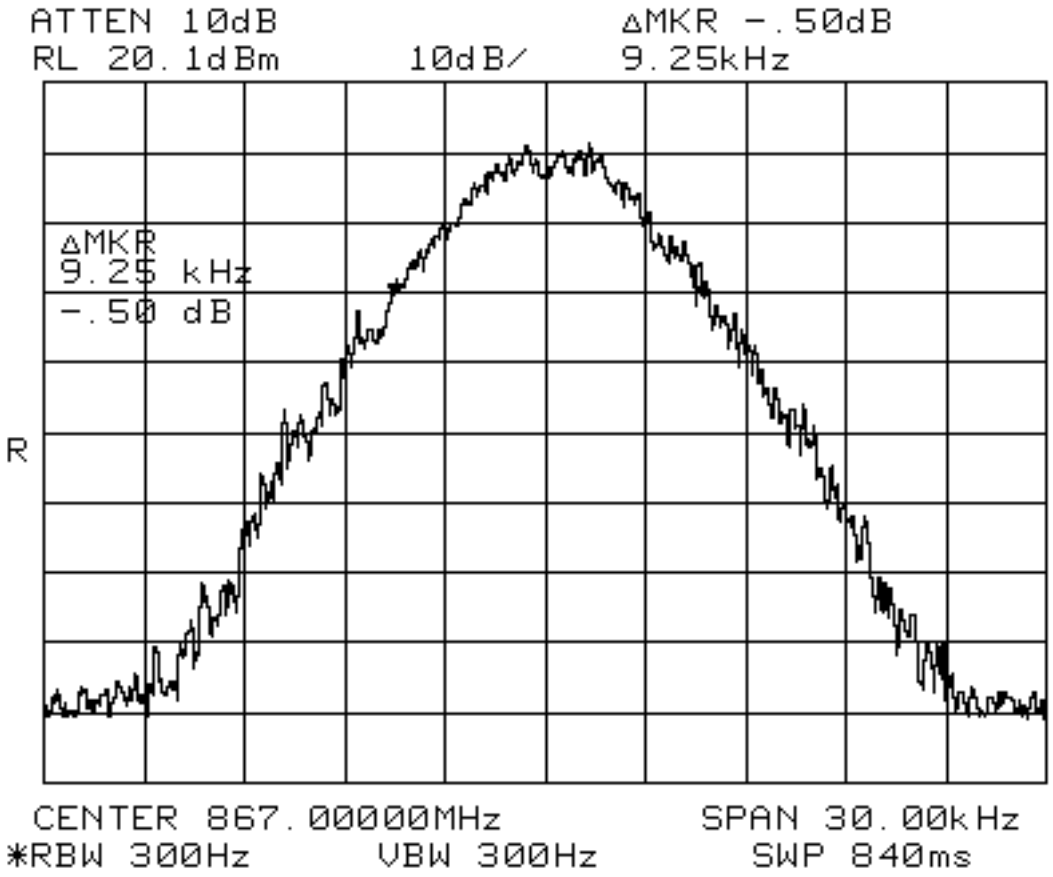
| | |
|---|---|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 2.989 |
| TESTED BY: David Light | DATE: 5/18/04 |

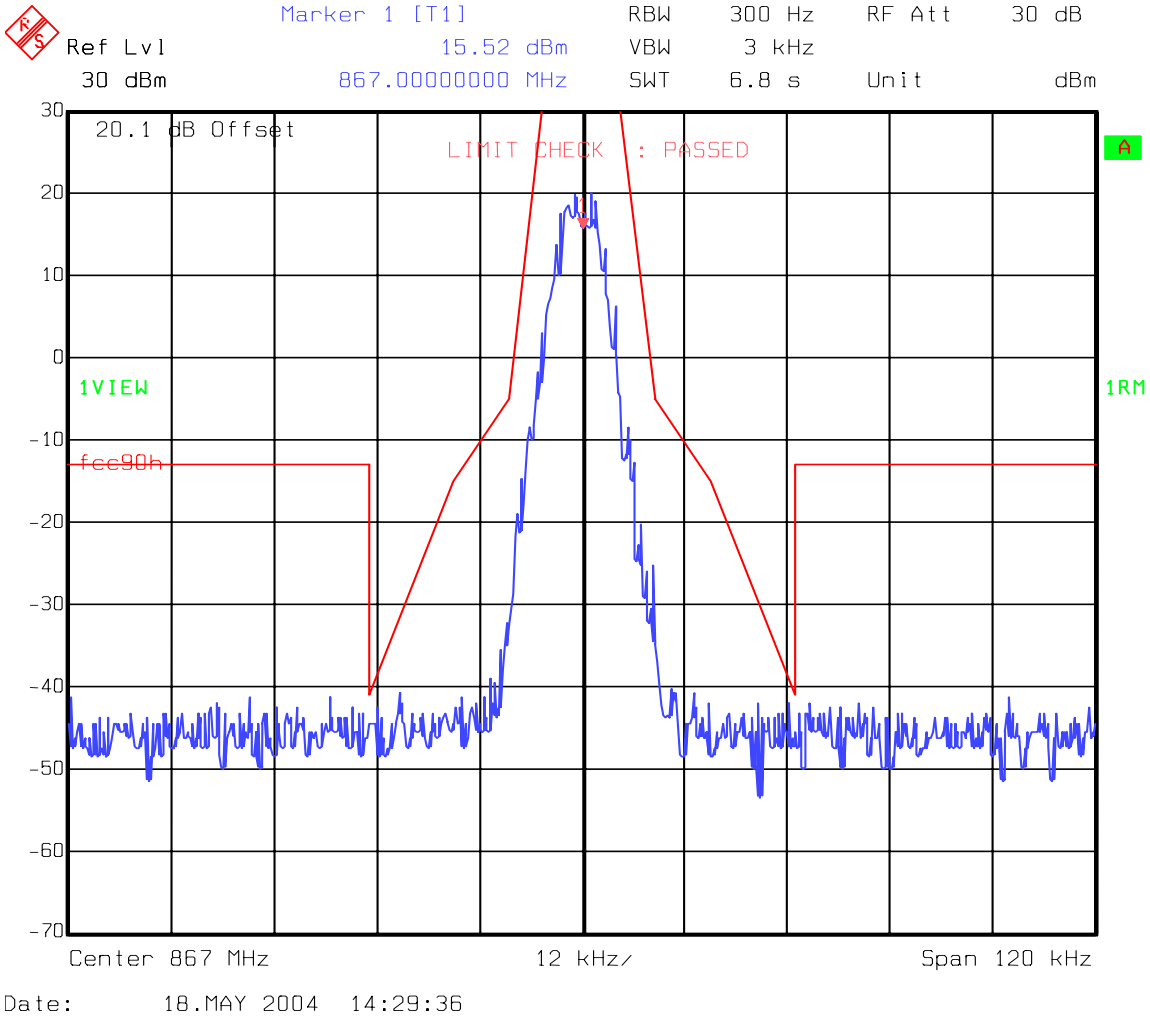
**Test Results:** Complies.

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

**Test Equipment Used:** 1464-1604-1629-1627

**Test Conditions:** 22$^{O}$C / 40% RH




Marker 1 [T1]
15.52 dBm
867.00000000 MHz
RBW 300 Hz
VBW 3 kHz
SWT 6.8 s
RF Att 30 dB
Unit dBm
Ref Lvl
30 dBm
20.1 dB Offset
LIMIT CHECK : PASSED
A
1VIEW
1RM
fcc90h
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 867 MHz
12 kHz/
Span 120 kHz
Date: 18.MAY 2004 14:29:36

## Section 5. Spurious Emissions at Antenna Terminals

| | |
|---|---|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 2.991 |
| TESTED BY: David Light | DATE:5/18/14 |

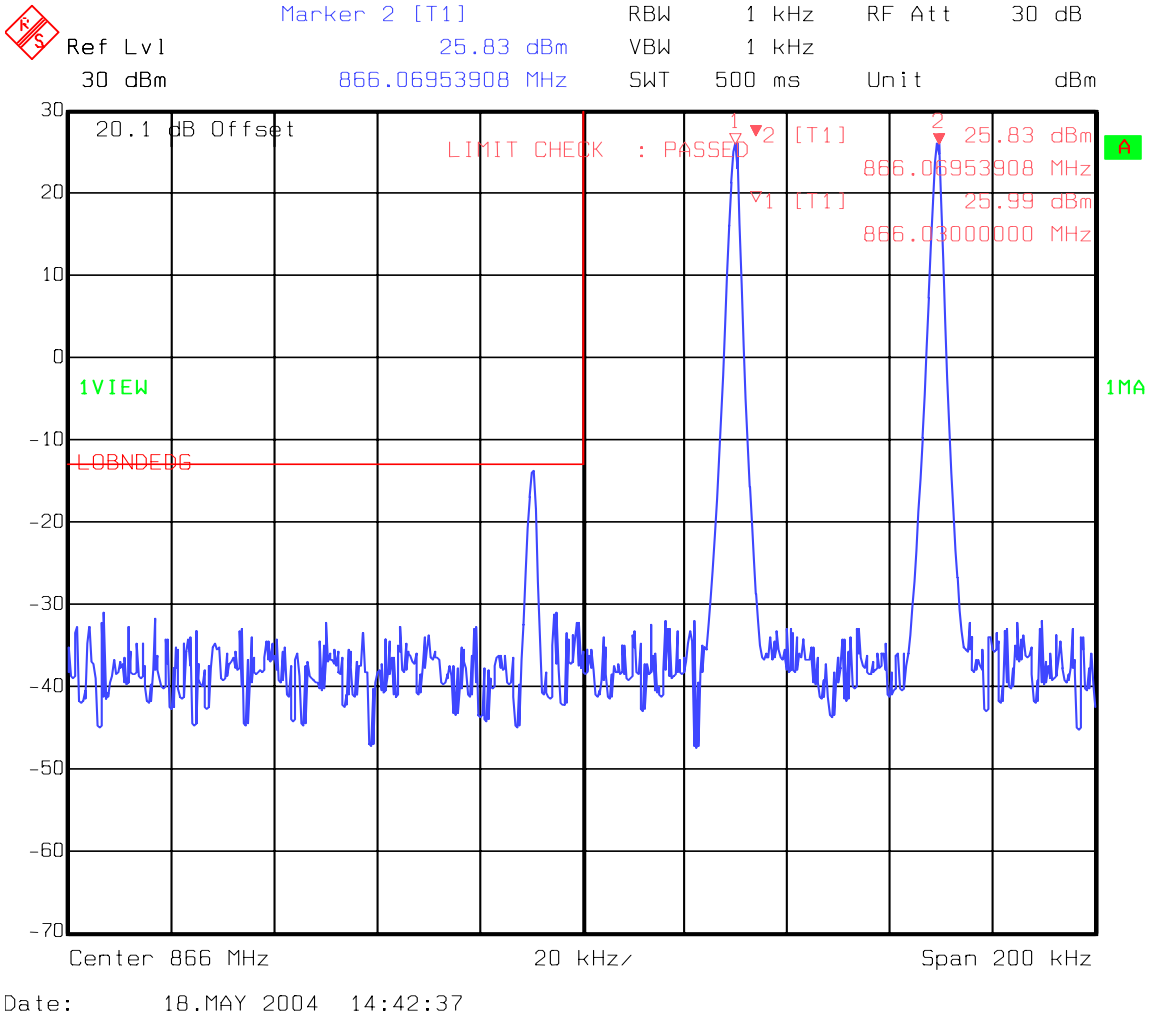
**Test Results:** Complies.

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

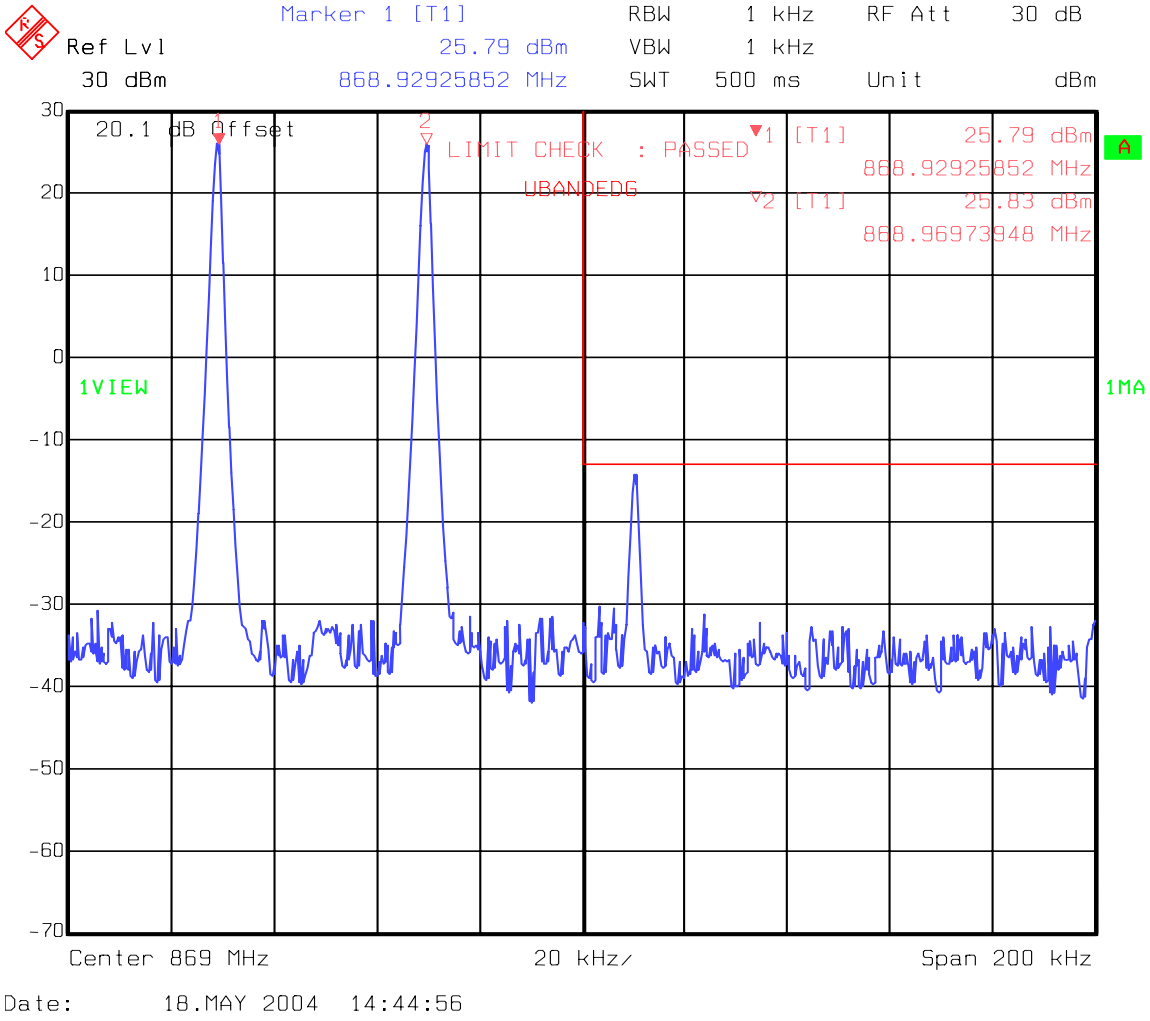
**Test Equipment Used:** 1036-1604-1629-1627

**Test Conditions:** $22^{O}$C / 40% RH

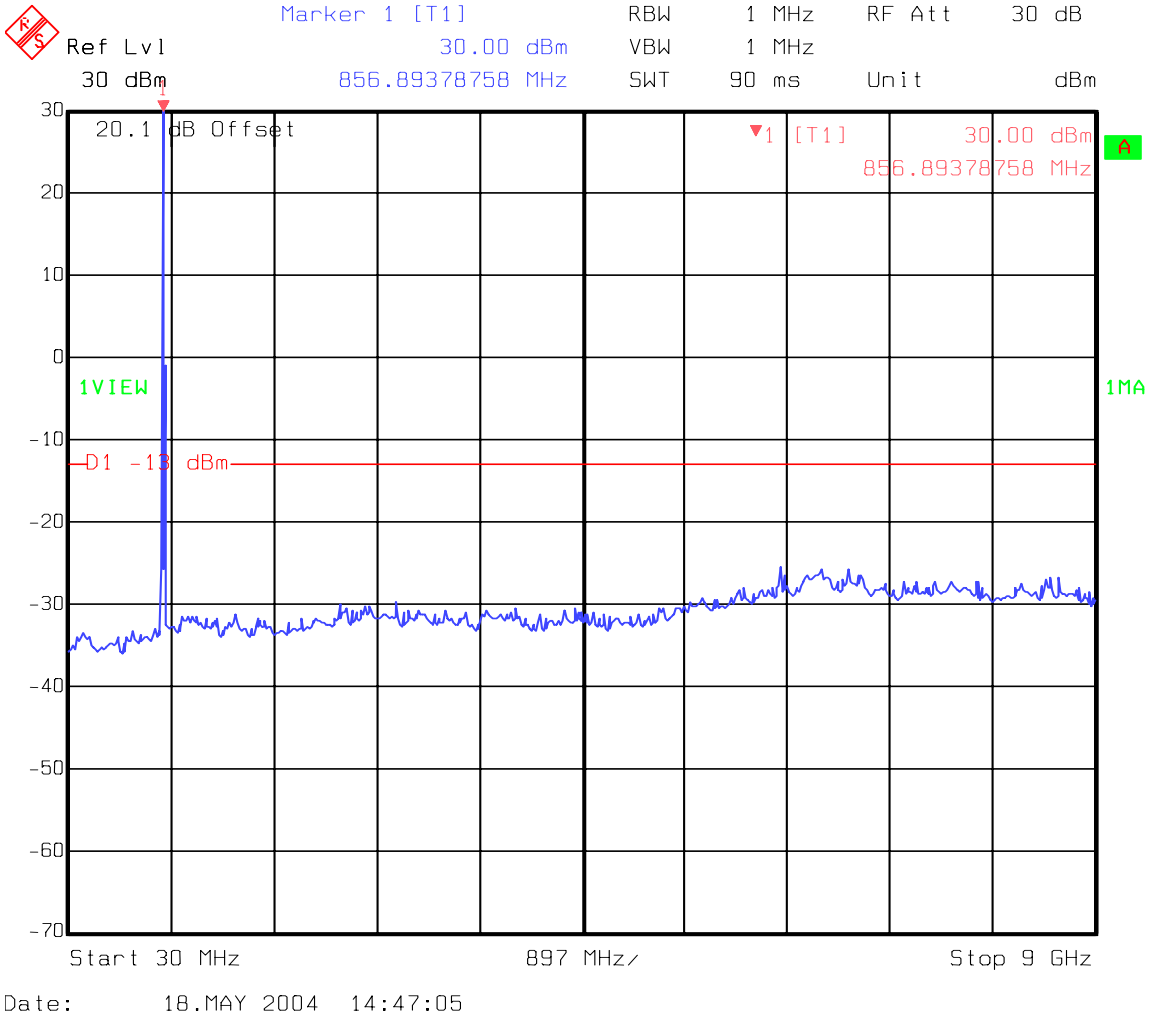
## Test Data – Spurious Emissions at Antenna Terminals



## Test Data – Spurious Emissions at Antenna Terminals



## Test Data – Spurious Emissions at Antenna Terminals



## Section 6. Field Strength of Spurious Emissions

| | |
|---|---|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 2.993 |
| TESTED BY: David Light | DATE: 5/18/04 |

**Test Results:** Complies.

**Test Data:** See attached table.

**Note:** See page A5 for applicable limit.

## Test Data - Radiated Emissions

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

Nemko Dallas, Inc.

### Field Strength of Spurious Emissions

Page 1 of 1 Complete X
Job No.: 4L0362 Date: 5/18/04 Preliminary
Specification: PT90 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 45
E.U.T.: 800 MHz Amplifier
Configuration: TX FULL POWER INTO LOAD
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

**Test Equipment Used**

Antenna: 1304 Directional Coupler:
Pre-Amp: Cable #1: 1484
Filter: 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 (dBd) | Limit (dBm) | ERP (dBm) | ERP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tx @ 867.0 MHz |
| 1734 | -74.7 | 29.9 | | 0 | 6.4 | -13 | -38.5 | 0.0001 | V | Noise floor |
| 2601 | -75.3 | 35.6 | | 0 | 8.0 | -13 | -31.8 | 0.0007 | V | Noise floor |
| 3468 | -75.3 | 37.1 | | 0 | 8.1 | -13 | -30.1 | 0.0010 | V | Noise floor |
| 4335 | -77.5 | 42.8 | | 0 | 7.9 | -13 | -26.8 | 0.0021 | V | Noise floor |
| 5202 | -78.8 | 40.6 | | 0 | 9.1 | -13 | -29.1 | 0.0012 | V | Noise floor |
| 6069 | -78.8 | 37.9 | | 0 | 9.5 | -13 | -31.4 | 0.0007 | V | Noise floor |
| 6936 | -76.2 | 38.3 | | 0 | 10.1 | -13 | -27.8 | 0.0017 | V | Noise floor |
| 7803 | -75.3 | 40.4 | | 0 | 9.4 | -13 | -25.4 | 0.0029 | V | Noise floor |
| 8670 | -74.8 | 40.3 | | 0 | 9.9 | -13 | -24.6 | 0.0035 | V | Noise floor |
| | | | | | | | | | | |
| 1734 | -74.7 | 32.7 | | 0 | 6.4 | -13 | -35.7 | 0.0003 | H | Noise floor |
| 2601 | -75.3 | 34.6 | | 0 | 8.0 | -13 | -32.7 | 0.0005 | H | Noise floor |
| 3468 | -75.3 | 35.8 | | 0 | 8.1 | -13 | -31.4 | 0.0007 | H | Noise floor |
| 4335 | -77.5 | 35.2 | | 0 | 7.9 | -13 | -34.4 | 0.0004 | H | Noise floor |
| 5202 | -78.8 | 36.3 | | 0 | 9.1 | -13 | -33.5 | 0.0005 | H | Noise floor |
| 6069 | -78.8 | 36.6 | | 0 | 9.5 | -13 | -32.7 | 0.0005 | H | Noise floor |
| 6936 | -76.2 | 37.8 | | 0 | 10.1 | -13 | -28.2 | 0.0015 | H | Noise floor |
| 7803 | -75.3 | 39.8 | | 0 | 9.4 | -13 | -26.1 | 0.0025 | H | Noise floor |
| 8670 | -74.8 | 41.8 | | 0 | 9.9 | -13 | -23.0 | 0.0050 | H | Noise floor |
| | | | | | | | | | | |

**Notes:** **No emissions were detected above the noise floor**
**Searched spectrum to the 10th harmonic of carrier**

## Photographs of Test Setup

## Section 7. Frequency Stability

| | |
|---|---|
| NAME OF TEST: Frequency Stability | PARA. NO.: 2.995 |
| TESTED BY: David Light | DATE: 5/19/04 |

**Test Results:** Complies.

**Measurement Data:** See attached tables.

## Test Data – Frequency Stability

**Nemko Dallas, Inc.**

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

### Frequency Stability

Page 1 of 1

Job No.: 4L0362 Date: 5/19/2004
Specification: Pt90 Temperature(°C): 24
Tested By: David Light Relative Humidity(%) 45
E.U.T.: 800 MHz Amp
Configuration: Tx CW signal
Sample Number: 1

**Test Equipment Used**

Antenna: Directional Coupler:
Pre-Amp: Cable #1: 1629
Filter: Cable #2:
Receiver: 1026
Attenuator #1 1478
Attenuator #2:

Measurement Uncertainty: $1x10^{-17}$ppm **Standard Test Frequency 867.000000 MHz**

| Temp (°C) | Measured Frequency (MHz) | Rho | Test Voltage | Freqeuncy Error (Hz) | Limit (+/-Hz) | Error (ppm) | Comment |
|---|---|---|---|---|---|---|---|
| 20 | 867.000000 | | 120 | 0 | 867.0 | 0 | |
| 20 | 867.000000 | | 138 | 0 | 867.0 | 0.0 | |
| 20 | 867.000000 | | 102 | 0 | 867.0 | 0.0 | |
| | | | | | | | |
| 50 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| 40 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| 30 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| | | | | | | | |
| 10 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| 0 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| -10 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| -20 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| -30 | 867.000000 | | 120 | 0 | 867.0 | 0.0 | |
| Notes: | | | | | | | |
| | | | | | | | |

## Section 8. Test Equipment List

| Nemko ID | Description | Manufacturer Model Number | Serial Number | Calibration Date | Calibration Due |
|---|---|---|---|---|---|
| 1036 | SPECTRUM ANALYZER | ROHDE & SCHWARZ FSEK30 | 830844/006 | 03/29/04 | 03/29/06 |
| 1464 | Spectrum analyzer | Hewlett Packard 8563E | 3551A04428 | 02/11/03 | 02/11/05 |
| 1484 | Cable 2.0-18.0 Ghz | Storm PR90-010-072 | N/A | 07/24/03 | 07/23/04 |
| 1485 | Cable 2.0-18.0 Ghz | Storm PR90-010-216 | N/A | 07/24/03 | 07/23/04 |
| 1304 | HORN ANTENNA | ELECTRO METRICS RGA-60 | 6151 | 09/22/03 | 09/22/05 |
| 1629 | CABLE, 6 ft | MEGAPHASE 10311 1GVT4 | N/A | CBU | N/A |
| 283 | Environmental Chamber with controller # 1189006 | ENVIROTRONICS SH27 & 2030-22844 | 129010083 | 05/06/04 | 05/06/05 |
| 1478 | 20db Attenuator DC 18 Ghz | MCL Inc. BW-S20W6 | NONE | CBU | N/A |
| 1604 | ATTENUATOR | NARDA 776B-20 | NONE | N/A | N/A |
| 1627 | CABLE, 5 ft | MEGAPHASE 10312 1GVT4 | N/A | 07/29/03 | 07/28/04 |

# ANNEX A - TEST METHODOLOGIES

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

**Minimum Standard:** Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

**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: Spurious Emissions at Antenna Terminals PARA. NO.: 2.991**

**Test Method:** RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.

VBW: $\Rightarrow$ RBW

The spectrum is searched up to 10 times the fundamental frequency.

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

**Minimum Standard:** Para. No. 90.210, see table 1 below for applicable mask.

**Table 1**

| Frequency Band (MHz) | Mask for equipment with Low Pass Filter | Mask for equipment without Low Pass Filter |
|---|---|---|
| Below 25 | A or B | A or C |
| 25 - 50 | B | C |
| 72 - 76 | B | C |
| 150 - 174 | B, D or E | C, D or E |
| 150 Paging only | B | C |
| 220 - 222 | F | F |
| 421 - 512 | B, D or E | C, D or E |
| 450 paging only | B | H |
| 806 - 821/ 851 - 866 | B | G |
| 821 - 824/ 866 - 869 | B | H |
| 896 - 901/ 935 - 940 | I | J |
| 902 - 928 | K | K |
| 929 - 930 | B | G |
| Above 940 | B | C |
| All other bands | B | C |

**NAME OF TEST: Field Strength of Spurious** **PARA. NO.: 2.993**

**Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.

**Test Method:** The reference antenna substitution method described in EIA/TIA 603-B was used. The transmitter under test was placed on a turntable. The receive antenna was located at a distance of 3 meters from the transmitter under test. The turntable was rotated 360 degrees until the maximum received level was noted. The transmitter under test was then replaced with a calibrated substitution with known gain. A signal generator was used to feed the substitution antenna and the signal generator output level was adjusted until the maximum level noted above was reached. The erp is the signal fed to the input of the substitution antenna plus any gain the antenna may have with reference to a dipole.

**NAME OF TEST: Frequency Stability** **PARA. NO.: 2.995**

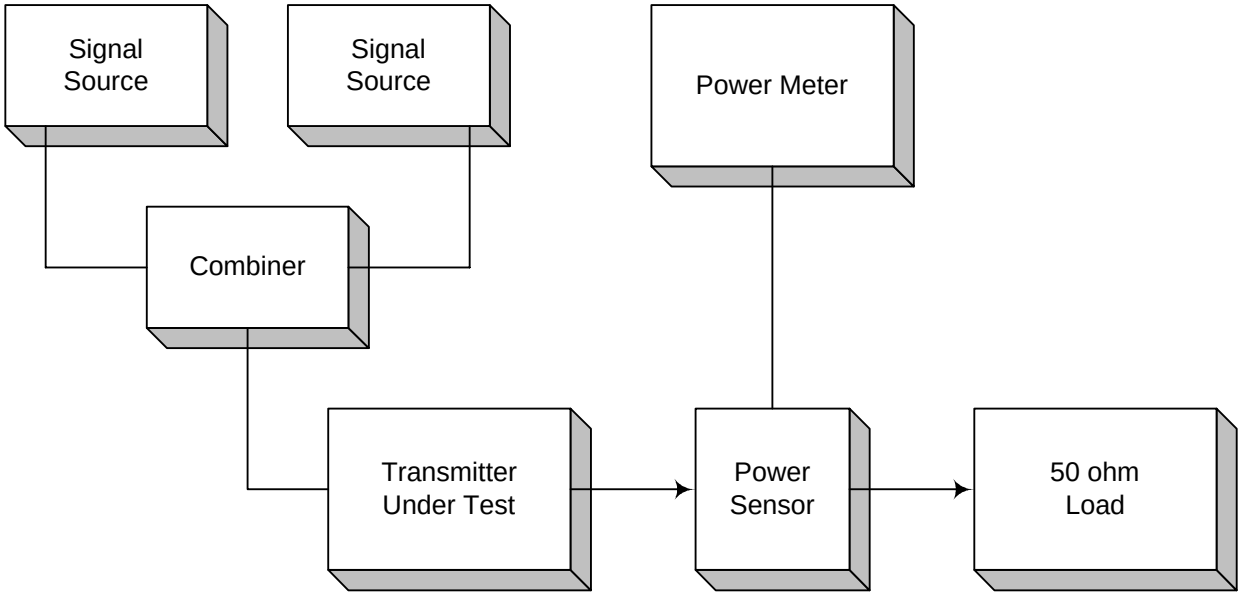
**Minimum Standard:** Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

**Table 2**

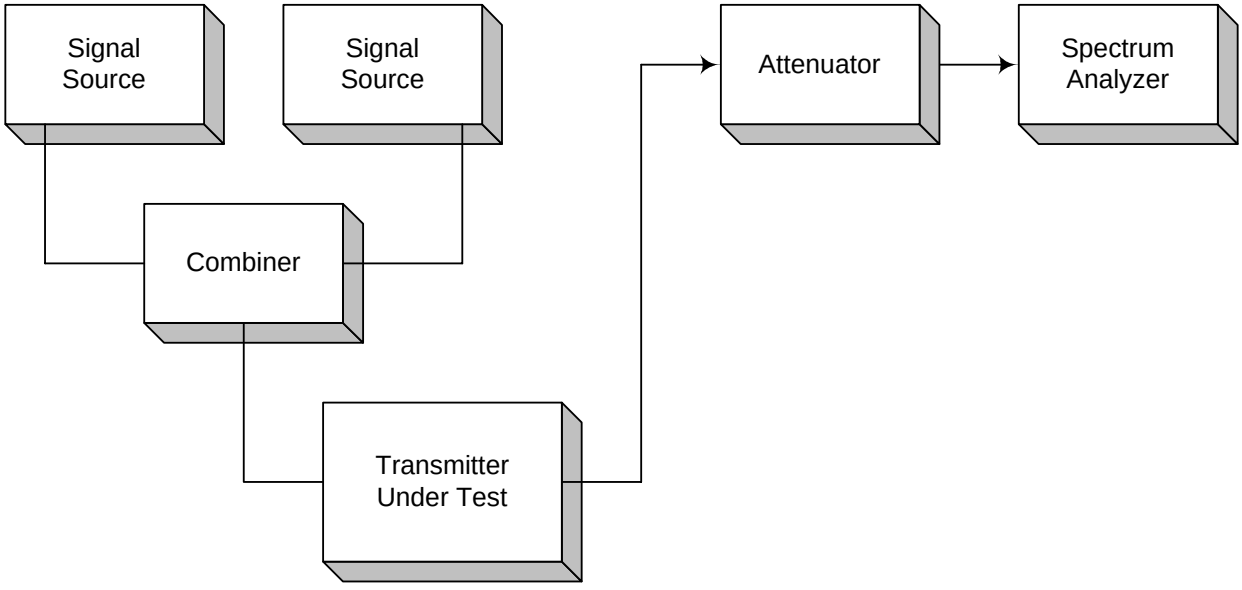
| Frequency Band (MHz) | Fixed And Base Stations | Mobile Stations | |
|---|---|---|---|
| | | > 2 Watts o/p pwr | < 2 Watts o/p pwr |
| Below 25 | 100 | 100 | 200 |
| 25 - 50 | 20 | 20 | 50 |
| 72 - 76 | 5 | - | 50 |
| 150 - 174 | 5 | 5 | 5 |
| 220 - 222 | 0.1 | 1.5 | 1.5 |
| 421 - 512 | 2.5 | 5 | 5 |
| 806 - 821 | 1.5 | 2.5 | 2.5 |
| 821 - 824 | 1.0 | 1.5 | 15 |
| 851 - 866 | 1.5 | 2.5 | 2.5 |
| 866 - 869 | 1.0 | 1.5 | 1.5 |
| 869 - 901 | 0.1 | 1.5 | 1.5 |
| 902 - 928 | 2.5 | 2.5 | 2.5 |
| 929 - 930 | 1.5 | - | - |
| 935 - 940 | 0.1 | 1.5 | 1.5 |
| 1427 - 1435 | 300 | 300 | 300 |
| Above 2450 | - | - | - |

# ANNEX B - TEST DIAGRAMS

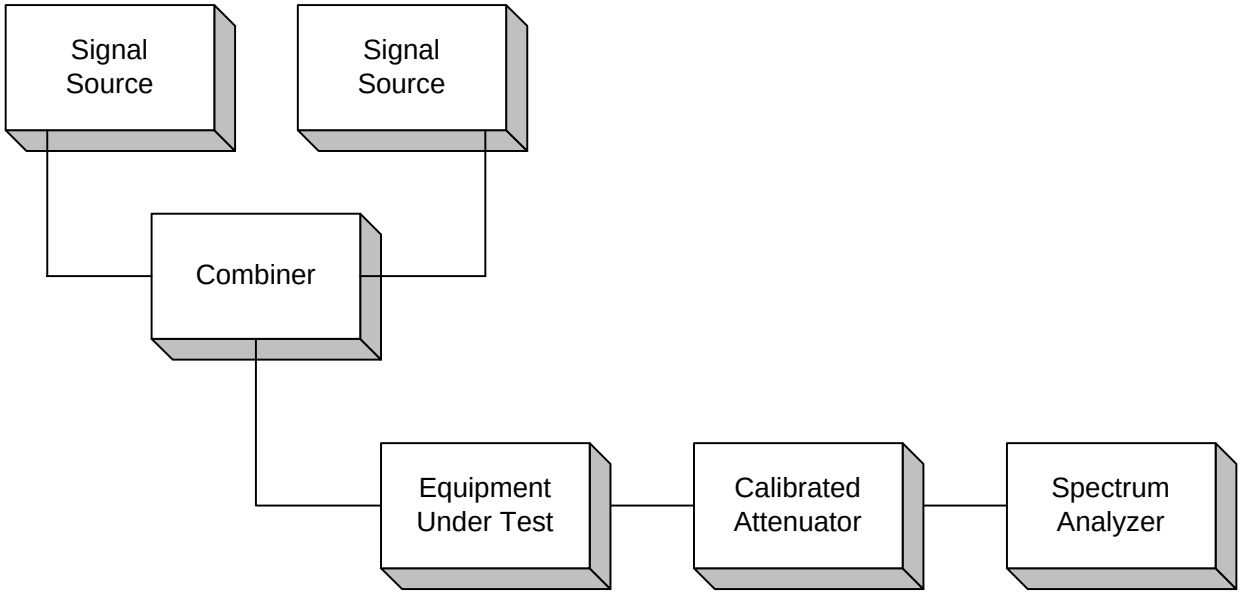
**Para. No. 2.985 - R.F. Power Output**



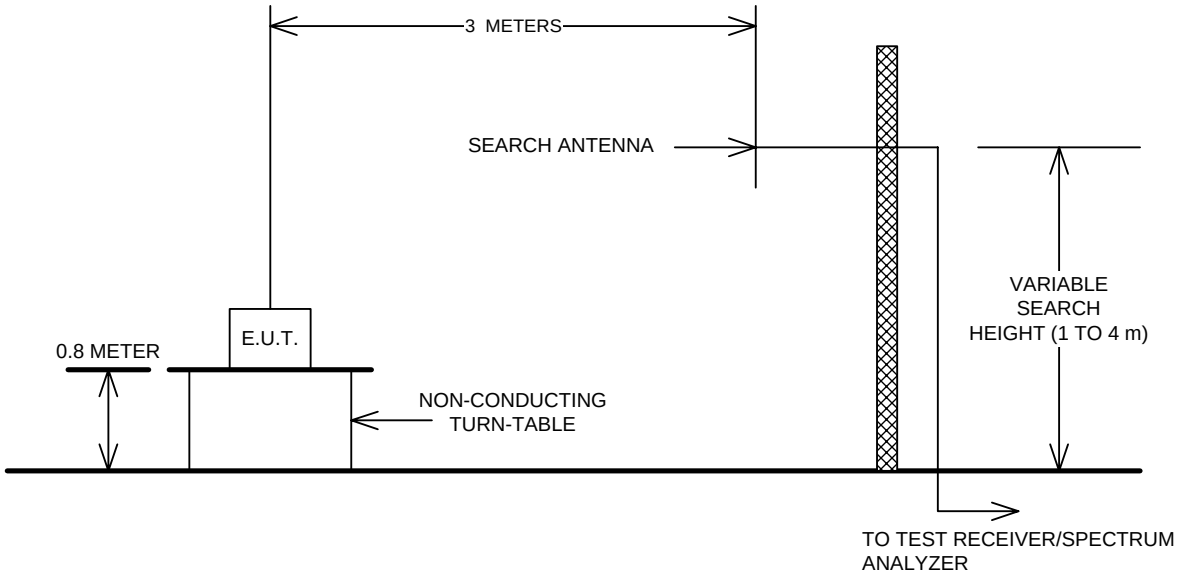

**Para. No. 2.989 - Occupied Bandwidth**



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




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



## Para. No. 2.995 - Frequency Stability