

**Nemko Test Report:** 4L0696RUS1

**Applicant:** E. F. Johnson

**Equipment Under Test:** 431x VHF Transceiver  
(E.U.T.)

**In Accordance With:** **FCC Part 90, Subpart I**  
Private Land Mobile Transmitter

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

**Authorized By:**   
David Light, Senior Wireless Engineer

**Date:** 1/26/05

## Table of Contents

|             |                                               |    |
|-------------|-----------------------------------------------|----|
| Section 1.  | Summary of Test Results .....                 | 3  |
| Section 2.  | General Equipment Specification .....         | 5  |
| Section 3.  | RF Power Output .....                         | 7  |
| Section 4.  | Modulation Characteristics .....              | 9  |
| Section 4.1 | Audio Frequency Response .....                | 10 |
| Section 4.2 | Audio Low-Pass Filter Response.....           | 11 |
| Section 4.3 | Modulation Limiting.....                      | 12 |
| Section 5.  | Occupied Bandwidth.....                       | 13 |
| Section 6.  | Spurious Emissions at Antenna Terminals ..... | 27 |
| Section 7.  | Field Strength of Spurious Emissions.....     | 37 |
| Section 8.  | Frequency Stability .....                     | 41 |
| Section 9.  | Transient Frequency Behaviour.....            | 43 |
| Section 10. | Test Equipment List.....                      | 48 |
| ANNEX A -   | TEST METHODOLOGIES.....                       | 49 |
| ANNEX B -   | TEST DIAGRAMS.....                            | 55 |

*EQUIPMENT:*    **431x VHF Transceiver**PROJECT NO.:    **4L0696RUS1**

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**Section 1.            Summary of Test Results**

Manufacturer:            E. F. Johnson

Model No.:              431x

Serial No.:              001

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. EIA/TIA 603 was used as a test method for these measurements.



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

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*EQUIPMENT:*    **431x VHF Transceiver**PROJECT NO.:    **4L0696RUS1**

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**Summary Of Test Data**

| NAME OF TEST                            | PARA. NO.         | RESULT   |
|-----------------------------------------|-------------------|----------|
| RF Power Output                         | 90.205            | Complies |
| Audio Frequency Response                | TIA EIA-603.3.2.6 | Complies |
| Audio Low-Pass Filter Response          | TIA EIA-603.3.2.6 | Complies |
| Modulation Limiting                     | TIA EIA-603.3.2.6 | Complies |
| Occupied Bandwidth                      | 90.210            | Complies |
| Spurious Emissions at Antenna Terminals | 90.210            | Complies |
| Field Strength of Spurious Emissions    | 90.210            | Complies |
| Frequency Stability                     | 90.213            | Complies |
| Transient Frequency Behavior            | 90.214            | Complies |

**Footnotes:**

.

**Section 2. General Equipment Specification****Transmitter**

|                                            |                                                                                                                                                                                                                                                                                                                  |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------|-------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|
| Supply Voltage Input:                      | 12 Vdc                                                                                                                                                                                                                                                                                                           |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Frequency Range:                           | 136 – 174 MHz                                                                                                                                                                                                                                                                                                    |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Tunable Bands:                             | 1                                                                                                                                                                                                                                                                                                                |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Type(s) of Modulation:                     | <table><tr><td>F3E<br/>(Voice)</td><td>F1D</td><td>F2D</td><td>D7W<br/>(QAM)</td><td>Other</td></tr><tr><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table> | F3E<br>(Voice)           | F1D                      | F2D                      | D7W<br>(QAM) | Other | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F3E<br>(Voice)                             | F1D                                                                                                                                                                                                                                                                                                              | F2D                      | D7W<br>(QAM)             | Other                    |              |       |                                     |                                     |                          |                          |                          |
| <input checked="" type="checkbox"/>        | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |              |       |                                     |                                     |                          |                          |                          |
| Internal/External Data Source:             | Internal (Vocoded voice)                                                                                                                                                                                                                                                                                         |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Emission Designator:                       | 8K10F1E, 8K10F1D<br>11K0F3E, 16K0F3E                                                                                                                                                                                                                                                                             |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Output Impedance:                          | 50 ohms                                                                                                                                                                                                                                                                                                          |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| RF Power Output (rated):                   | 20 watts                                                                                                                                                                                                                                                                                                         |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Channel Spacing(s):                        | 12.5 kHz, 25 kHz                                                                                                                                                                                                                                                                                                 |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Operator Selection of Operating Frequency: | Pre-programmed channel selection                                                                                                                                                                                                                                                                                 |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |
| Power Output Adjustment Capability:        | Not adjustable                                                                                                                                                                                                                                                                                                   |                          |                          |                          |              |       |                                     |                                     |                          |                          |                          |

**Receiver**

|                                            |                                    |
|--------------------------------------------|------------------------------------|
| Frequency Range:                           | 136 – 174 MHz                      |
| Tunable Bands:                             | 1                                  |
| Operator Selection of Operating Frequency: | Pre-programmed frequency selection |

*EQUIPMENT:*    **431x VHF Transceiver**

PROJECT NO.:    **4L0696RUS1**

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**System Description**

The 431x is a 20 watt VHF radio for mobile radio services. The radio functions as a normal Push-to-Talk type radio/

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

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### Section 3. RF Power Output

|                               |                    |
|-------------------------------|--------------------|
| NAME OF TEST: RF Power Output | PARA. NO.: 2.985   |
| TESTED BY: Kevin Rose         | DATE: 19 DEC. 2004 |

**Measurement Results:** Complies.

**Measurement Data:**

EQUIPMENT: **431x VHF Transceiver**PROJECT NO.: **4L0696RUS1**

|  |                  | <b>Dallas Headquarters:</b><br>802 N. Kealy<br>Lewisville, TX 75057<br>Tel: (972) 436-9600<br>Fax: (972) 436-2667 |                |                 |                |                |                 |
|-----------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------|----------------|-----------------|----------------|----------------|-----------------|
| <b><u>RF Power Output (Conducted)</u></b>                                         |                  |                                                                                                                   |                |                 |                |                |                 |
| Job No.: 4L0696                                                                   |                  | Date: 1/19/2005                                                                                                   |                |                 |                |                |                 |
| Specification: CFR 47, Part 2                                                     |                  | Temperature(°C): 23                                                                                               |                |                 |                |                |                 |
| Tested By: Kevin Rose                                                             |                  | Humidity(%) 42                                                                                                    |                |                 |                |                |                 |
| E.U.T.: 431X Mobile                                                               |                  |                                                                                                                   |                |                 |                |                |                 |
| Configuration: Transmit                                                           |                  |                                                                                                                   |                |                 |                |                |                 |
| Detector: Average ▼                                                               |                  |                                                                                                                   |                |                 |                |                |                 |
| <b><u>Test Equipment Used:</u></b>                                                |                  |                                                                                                                   |                |                 |                |                |                 |
| Power Meter: 2072                                                                 |                  | Directional Coupler: _____                                                                                        |                |                 |                |                |                 |
| Power Sensor: 2071                                                                |                  | Cable #1: 1629                                                                                                    |                |                 |                |                |                 |
| Load: _____                                                                       |                  | Cable #2: _____                                                                                                   |                |                 |                |                |                 |
| Spectrum Analyzer: _____                                                          |                  | Cable #3: _____                                                                                                   |                |                 |                |                |                 |
| Attenuator #1: 1064                                                               |                  | Cable #4: _____                                                                                                   |                |                 |                |                |                 |
| Attenuator #2: 1604                                                               |                  | Cable #5: _____                                                                                                   |                |                 |                |                |                 |
| Attenuator #3: _____                                                              |                  | Cable #6: _____                                                                                                   |                |                 |                |                |                 |
| Attenuator #4: _____                                                              |                  |                                                                                                                   |                |                 |                |                |                 |
| Measurement Uncertainty: +/- .7 dB                                                |                  |                                                                                                                   |                |                 |                |                |                 |
|                                                                                   |                  | 136 MHz                                                                                                           | 154 MHz        | 174 MHz         | 136 MHz        | 154 MHz        | 174 MHz         |
| Test Conditions                                                                   |                  | Carrier Power(watts)                                                                                              |                |                 | Rel. to Rated  |                |                 |
|                                                                                   |                  | RF Channel Low                                                                                                    | RF Channel Mid | RF Channel High | RF Channel Low | RF Channel Mid | RF Channel High |
| T <sub>nom</sub>                                                                  | V <sub>nom</sub> | 18.7                                                                                                              | 22.9           | 21.4            | -0.29          | 0.59           | 0.29            |
|                                                                                   | V <sub>min</sub> | 16.8                                                                                                              | 20.7           | 19.7            | -0.75          | 0.14           | -0.07           |
|                                                                                   | V <sub>max</sub> | 19.2                                                                                                              | 23.1           | 21.6            | -0.17          | 0.62           | 0.34            |
| T <sub>min</sub>                                                                  | V <sub>nom</sub> | -                                                                                                                 | -              | -               |                |                |                 |
|                                                                                   | V <sub>min</sub> | -                                                                                                                 | -              | -               |                |                |                 |
|                                                                                   | V <sub>max</sub> | -                                                                                                                 | -              | -               |                |                |                 |
| T <sub>max</sub>                                                                  | V <sub>nom</sub> | -                                                                                                                 | -              | -               |                |                |                 |
|                                                                                   | V <sub>min</sub> | -                                                                                                                 | -              | -               |                |                |                 |
|                                                                                   | V <sub>max</sub> | -                                                                                                                 | -              | -               |                |                |                 |
| Maximum deviation from rated(normal test conditions)dB: 0.59                      |                  |                                                                                                                   |                |                 |                |                |                 |
| Maximum deviation from rated(extreme test conditions)dB: -0.75                    |                  |                                                                                                                   |                |                 |                |                |                 |



*EQUIPMENT:*    **431x VHF Transceiver**PROJECT NO.:    **4L0696RUS1**

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**Section 4.            Modulation Characteristics**

|                                          |                    |
|------------------------------------------|--------------------|
| NAME OF TEST: Modulation Characteristics | PARA. NO.: 2.987   |
| TESTED BY: Kevin Rose                    | DATE: 29 Nov. 2004 |

**Measurement Results:**        Complies.**Measurement Data:**            See following pages

**Description of modulation:** Modulation input to the radio is voice via a microphone. The radio has three modes of operation:

- 1) Narrow band voice for 12.5 kHz channels
- 2) Wideband voice for 25 kHz channels
- 3) Data modulation. In this mode the voice input signal goes through a Vocoder to translate the audio to data.

**Description of baseband filtering:** The radio has a low-pass audio filter.

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

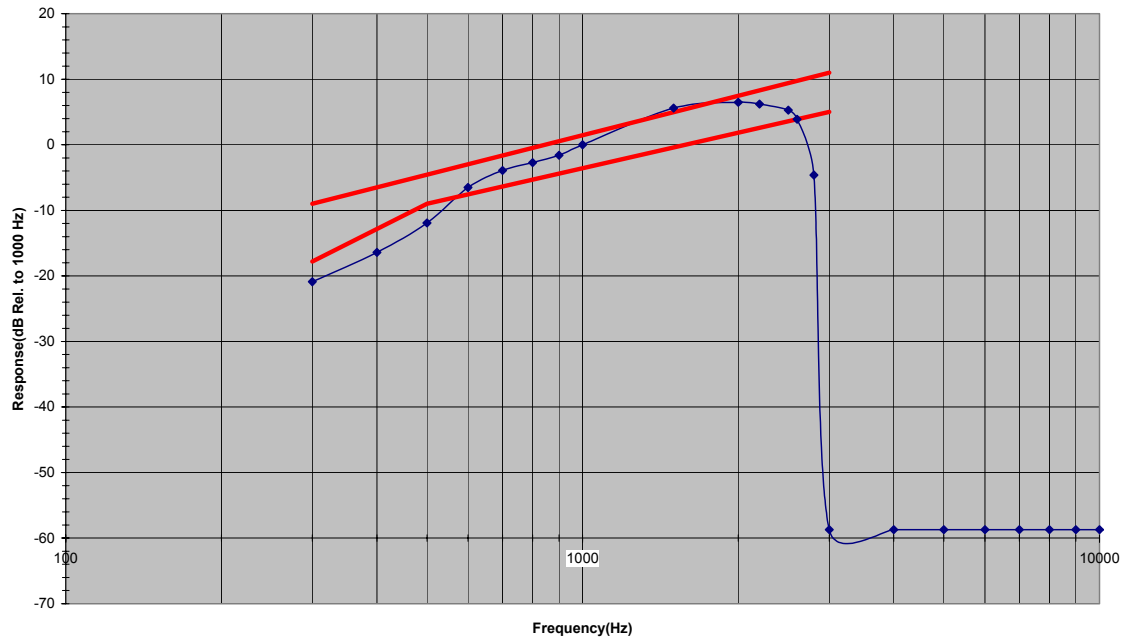
## Section 4.1 Audio Frequency Response

NAME OF TEST: Audio Frequency Response

PARA. NO.: 2.987(a)

TESTED BY: Kevin Rose

DATE: 7 DEC. 2004



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

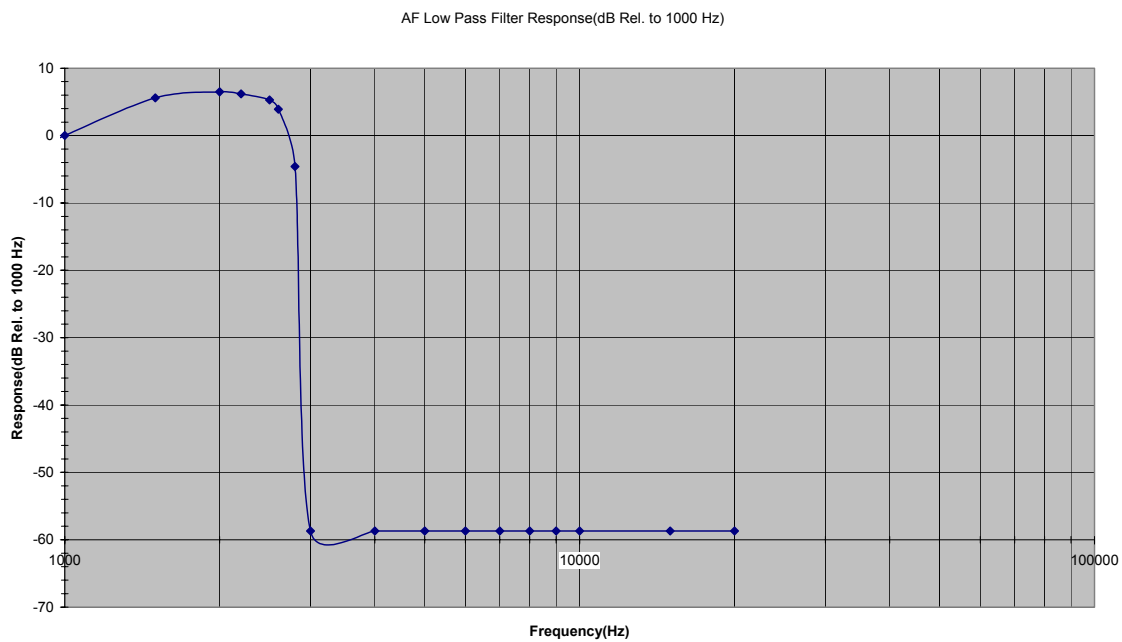
## Section 4.2 Audio Low-Pass Filter Response

NAME OF TEST: Audio Low-Pass Filter Response

PARA. NO.: 2.987(a)

TESTED BY: Kevin Rose

DATE: 7 DEC. 2004



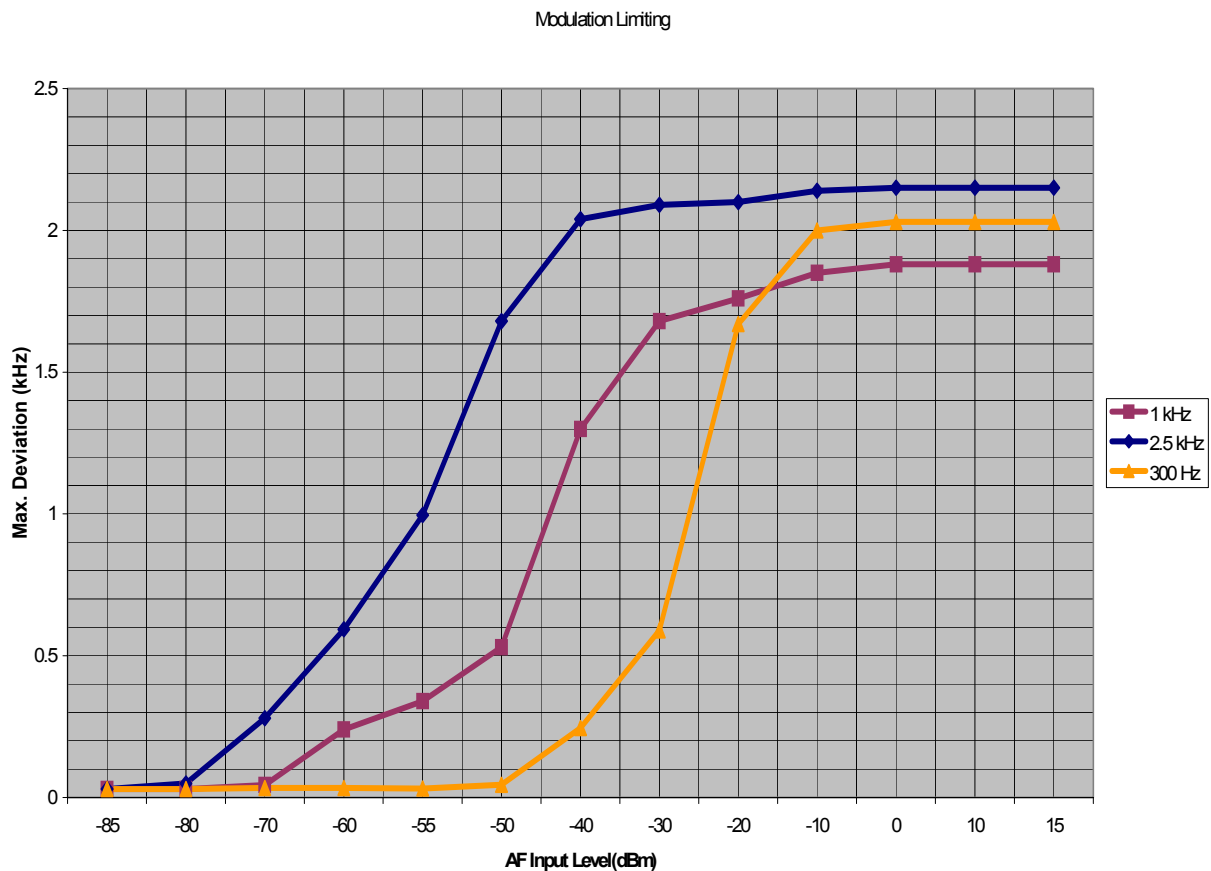
## Section 4.3 Modulation Limiting

NAME OF TEST: Modulation Limiting

PARA. NO.: 2.987(b)

TESTED BY: Kevin Rose

DATE: 7 DEC. 2004

Maximum deviation for non-voice modulation  $\pm 3$  kHz.

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PROJECT NO.:    **4L0696RUS1**

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## **Section 5.            Occupied Bandwidth**

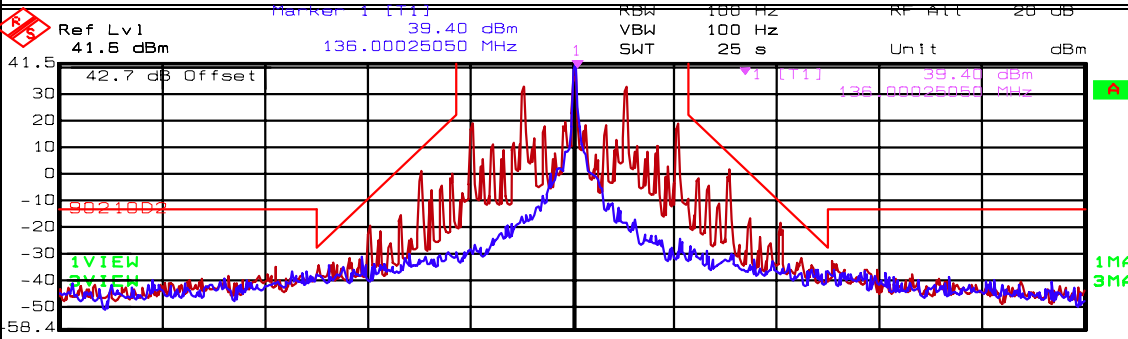
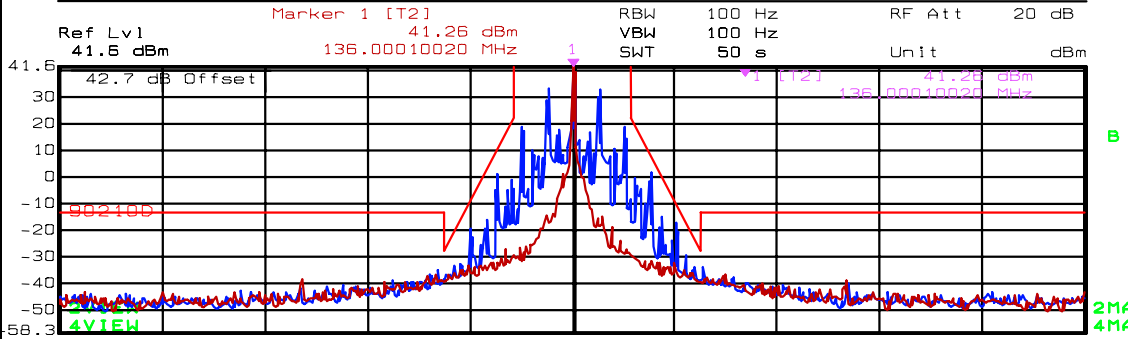
|                                  |                   |
|----------------------------------|-------------------|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 2.989  |
| TESTED BY: Kevin Rose            | DATE: 9 DEC. 2004 |

**Measurement Results:**        Complies.

**Measurement Data:**            See attached data

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

|                                                                                      |                        |                                                                                                                   |                |
|--------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------|----------------|
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| <b>Nemko Dallas, Inc.</b>                                                            |                        |                                                                                                                   |                |
| <b>Data</b>                                                                          |                        | <b>Occupied</b>                                                                                                   |                |
| Page 1 of 6                                                                          |                        | Complete <u>X</u>                                                                                                 |                |
| Job No.:                                                                             | 4L0696                 | Date:                                                                                                             | 12/9/2004      |
| Specification:                                                                       | Part 90/RSS 119        | Temperature(°C):                                                                                                  | 21             |
| Tested By:                                                                           | Kevin Rose             | Relative Humidity(%)                                                                                              | 33             |
| E.U.T.:                                                                              | 431xx vhf analog radio |                                                                                                                   |                |
| Configuration:                                                                       |                        |                                                                                                                   |                |
| Sample Number:                                                                       | 1                      |                                                                                                                   |                |
| Location:                                                                            | Lab 1                  | RBW:                                                                                                              | Refer to plots |
| Detector Type:                                                                       | Peak                   | VBW:                                                                                                              | Refer to plots |
| <b>Test Equipment Used</b>                                                           |                        |                                                                                                                   |                |
| Antenna:                                                                             |                        | Directional Coupler:                                                                                              | 1054           |
| Pre-Amp:                                                                             |                        | Cable #1:                                                                                                         | 1627           |
| Filter:                                                                              |                        | Cable #2:                                                                                                         |                |
| Receiver:                                                                            | 1036                   | Cable #3:                                                                                                         |                |
| Attenuator #1:                                                                       | 1470                   | Cable #4:                                                                                                         |                |
| Attenuator #2:                                                                       | 1471                   | Mixer:                                                                                                            |                |
| Additional equipment used:                                                           |                        |                                                                                                                   |                |
| Measurement Uncertainty:                                                             | +/-1.7 dB              |                                                                                                                   |                |
|   |                        |                                                                                                                   |                |
|  |                        |                                                                                                                   |                |
| Date: 09 DEC 2004 10:52:30                                                           |                        |                                                                                                                   |                |
| <b>Notes:</b> 136 Narrowband - 16K0F3E                                               |                        |                                                                                                                   |                |
| AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz                      |                        |                                                                                                                   |                |
| AF level: -35 dBm                                                                    |                        |                                                                                                                   |                |

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



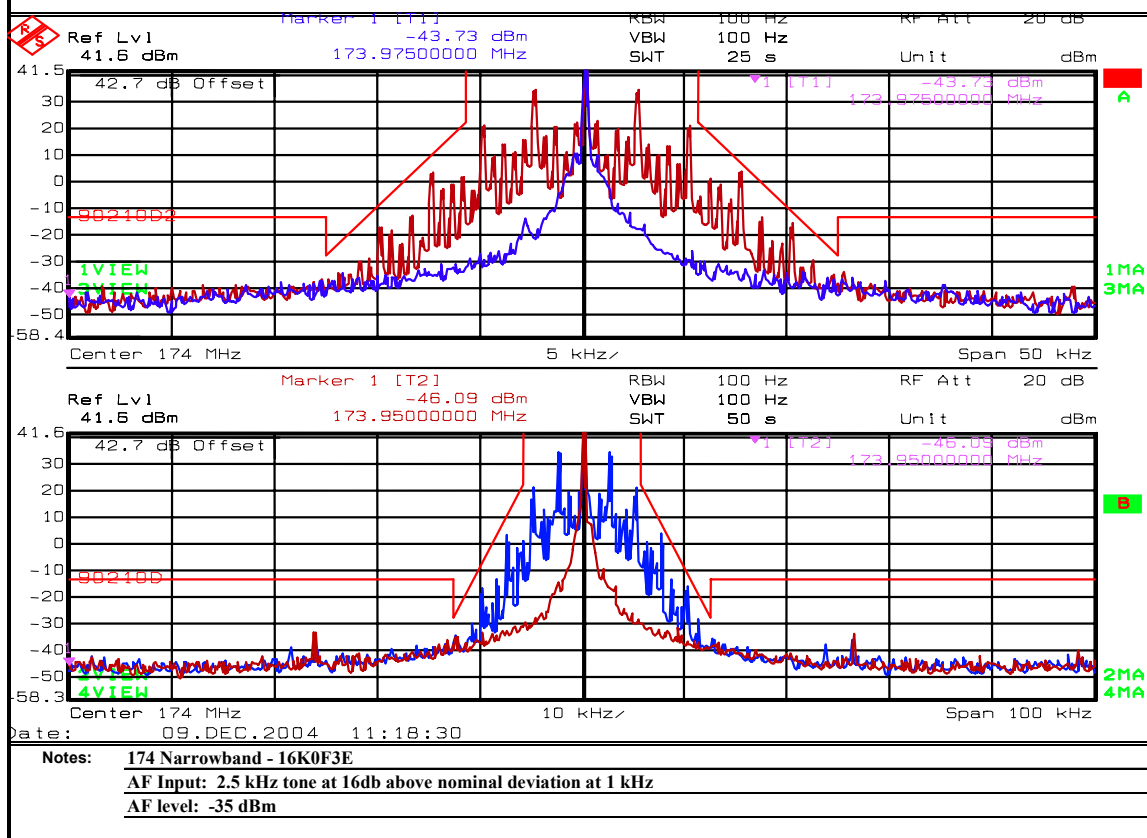
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Page 3 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Kevin Rose Relative Humidity(%) 33  
E.U.T.: 431xx vhf analog radio  
Configuration:



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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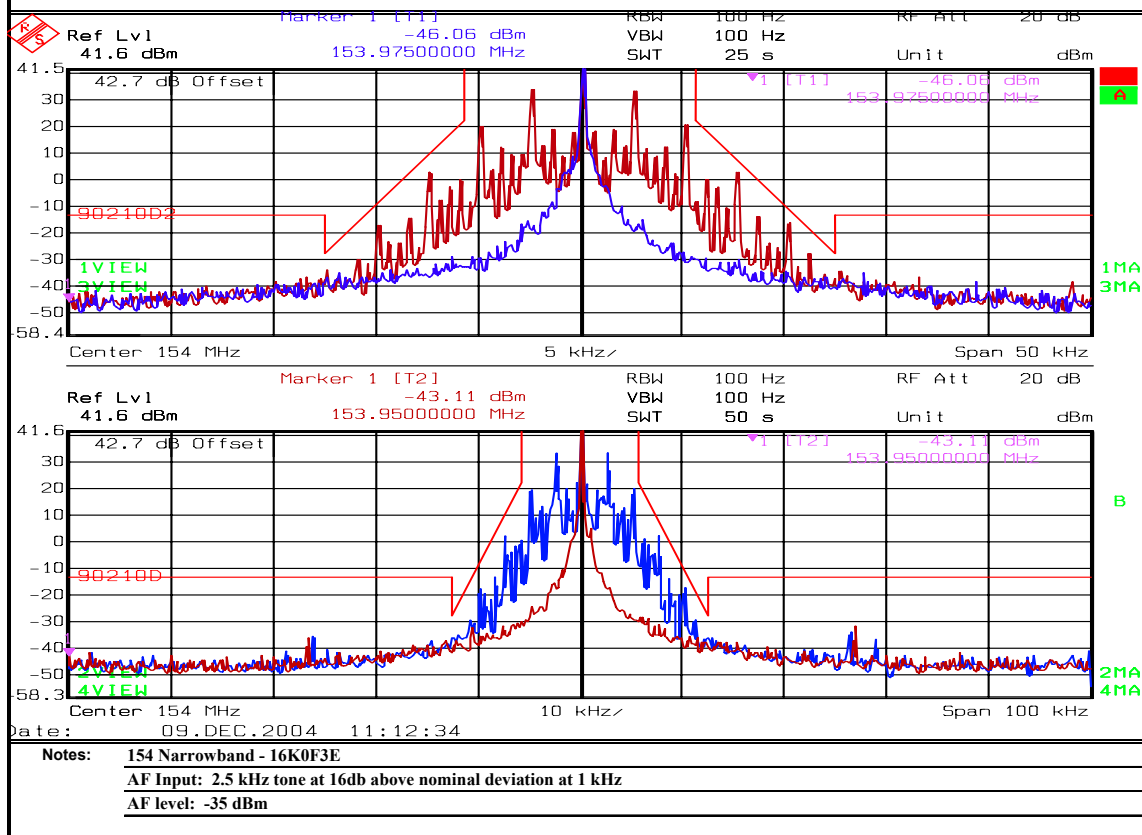
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## Data Plot

Page 2 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:

## Occupied Bandwidth





EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



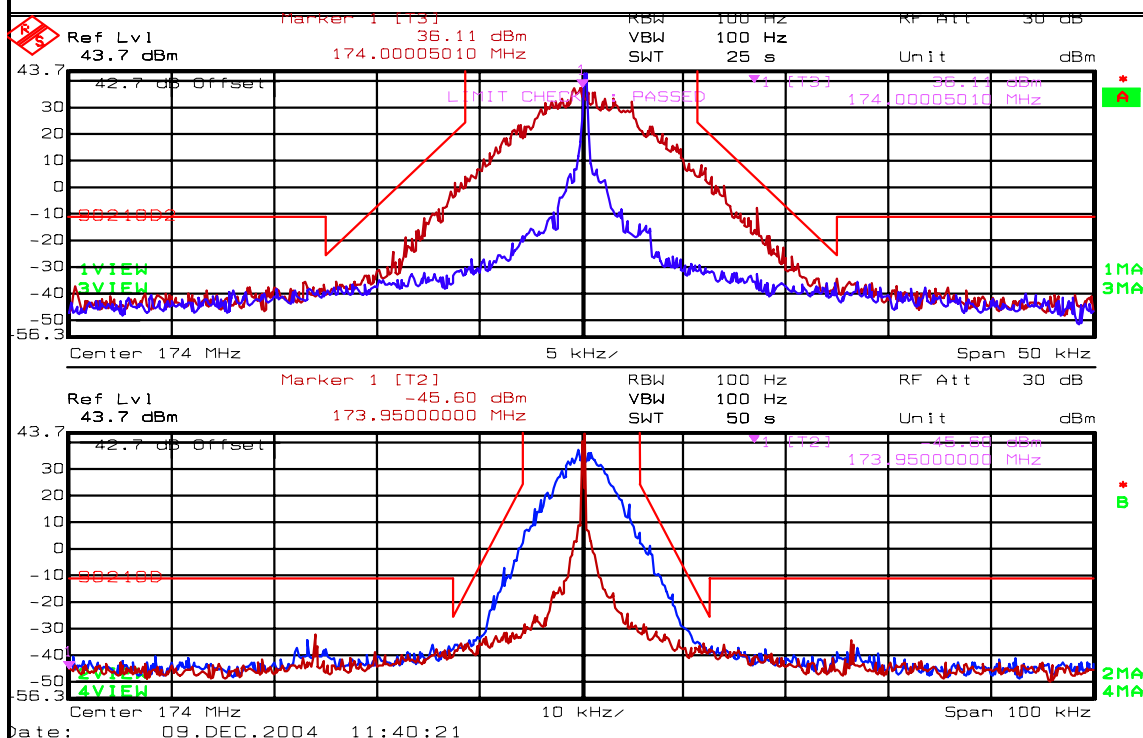
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Page 4 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Kevin Rose Relative Humidity(%) 33  
E.U.T.: 431xx vhf analog radio  
Configuration:



Notes: 174 11K0F1D - Mask D  
AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz  
AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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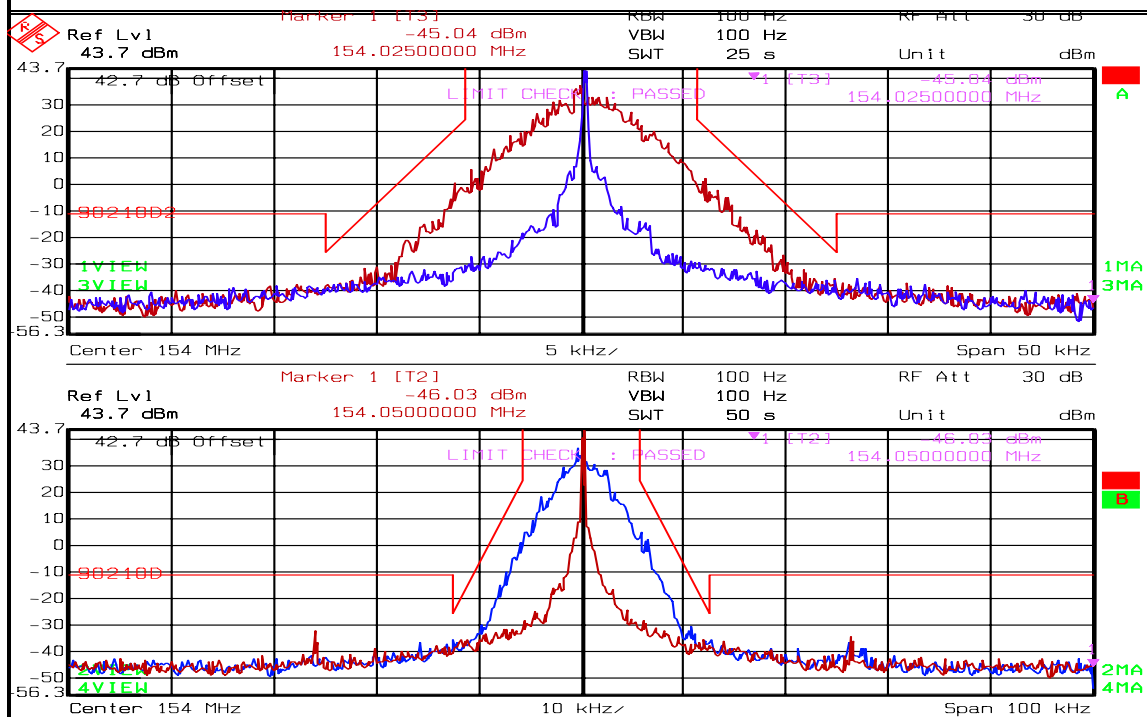
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## Data Plot

Page 5 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:

## Occupied Bandwidth



## Notes: 154 11K0FID - Mask D

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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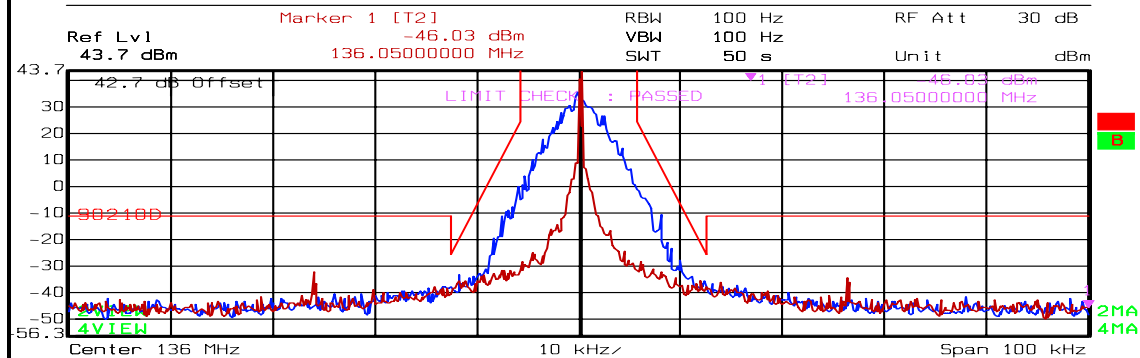
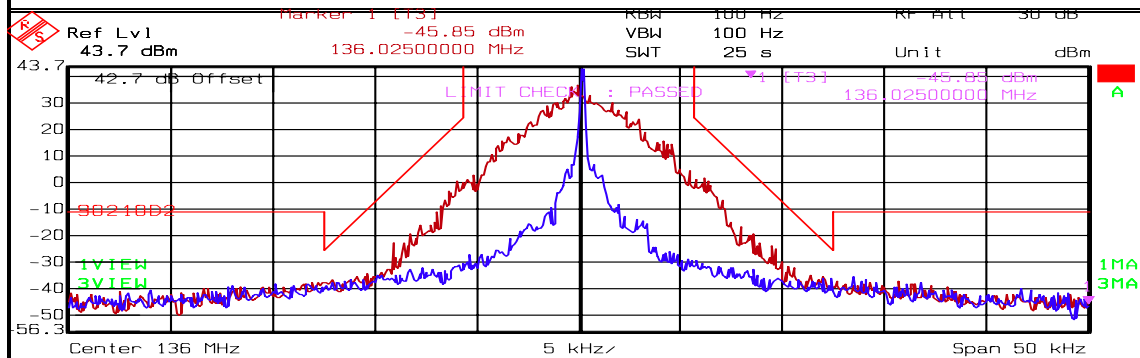
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## Data Plot

## Occupied Bandwidth

Page 6 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:



Date: 09.DEC.2004 11:51:39

## Notes: 136 11K0FID - Mask D

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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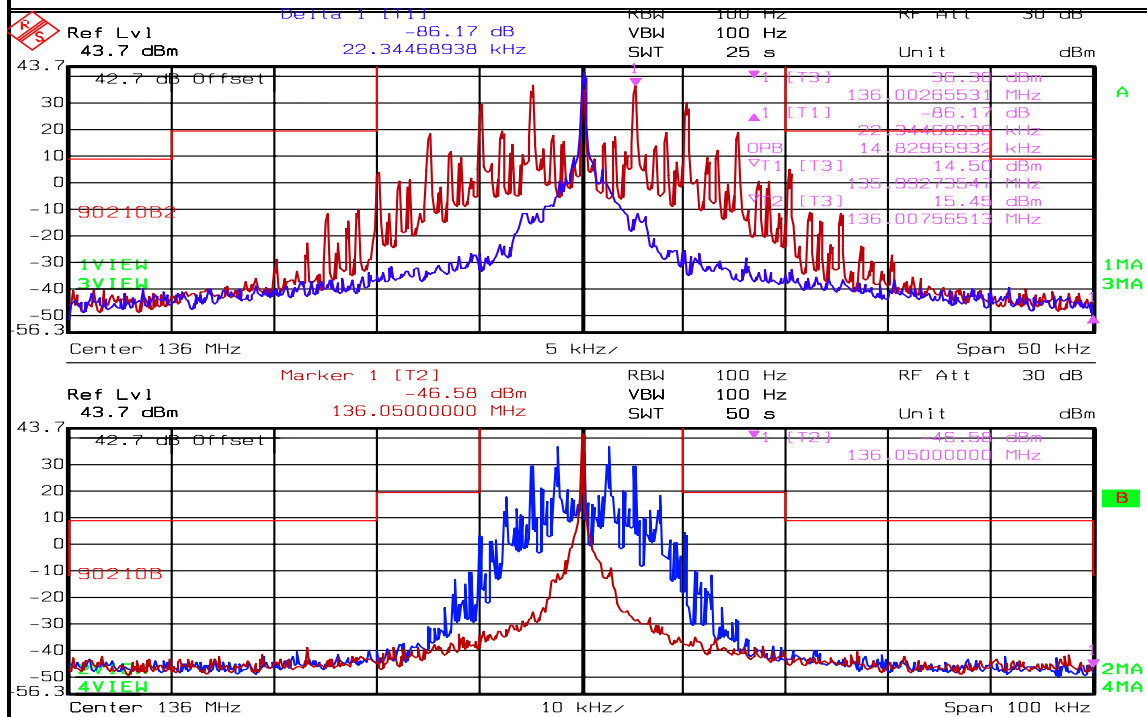
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## Data Plot

## Occupied Bandwidth

Page 6 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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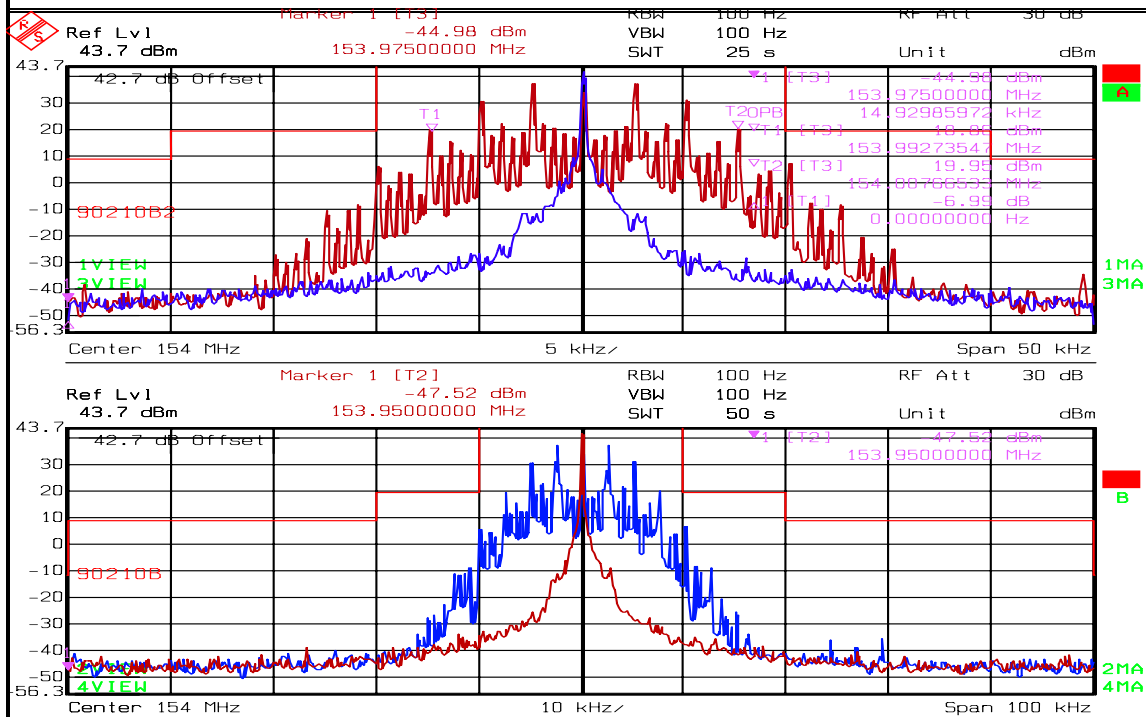
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## Data Plot

Page 6 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:

## Occupied Bandwidth



## Notes:

154 broadband - 16K0F3E  
AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz  
AF level: -35 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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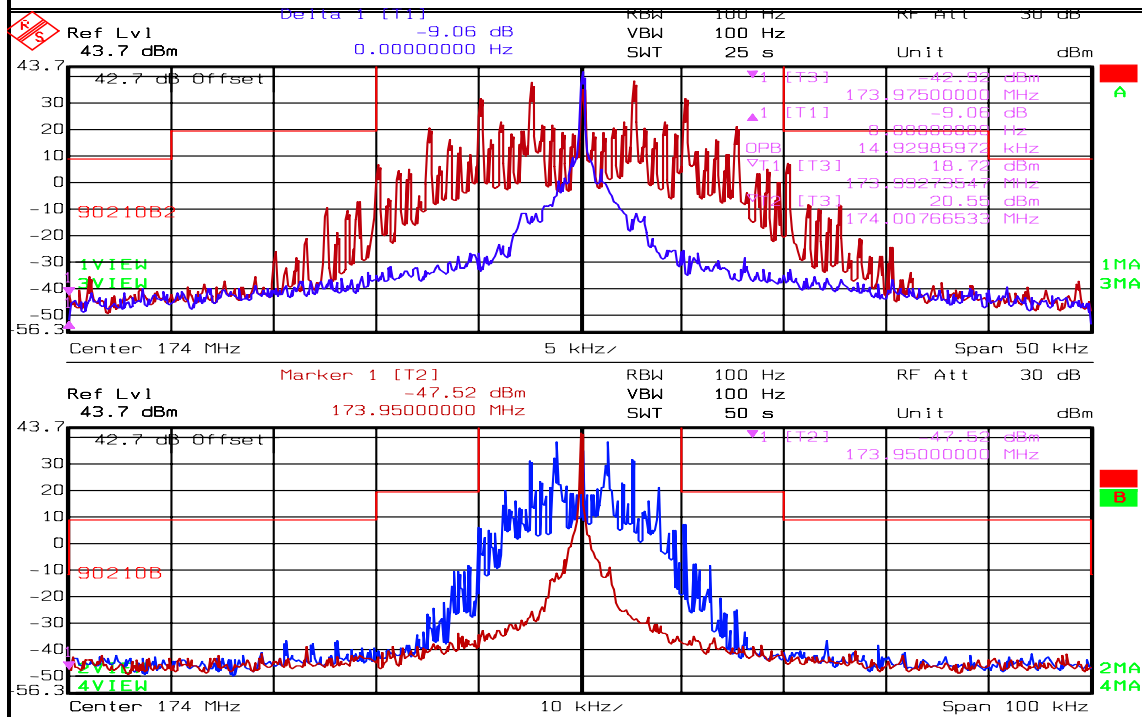
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## Data Plot

Page 6 of 6

Job No.: 4L0696 Date: 12/9/2004  
Specification: Part 90/RSS 119 Temperature(°C): 21  
Tested By: Tom Tidwell Relative Humidity(%) 33  
E.U.T.: 43100 vhf analog radio  
Configuration:

## Occupied Bandwidth



Date: 09.DEC.2004 13:18:50

## Notes: 174 broadband - 16K0F3E

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -35 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |                                                                                                                   |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            | <b>Dallas Headquarters:</b><br>802 N. Kealy<br>Lewisville, TX 75057<br>Tel: (972) 436-9600<br>Fax: (972) 436-2667 |  |
| <b>Nemko Dallas, Inc.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |                                                                                                                   |  |
| <b>Data Plot</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            | <b>Occupied Bandwidth</b>                                                                                         |  |
| Page 1 of 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            | Complete <u>X</u>                                                                                                 |  |
| Job No.: 4L0696                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Date: 1/13/2005            | Preliminary: _____                                                                                                |  |
| Specification: Part 90/RSS 119                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Temperature(°C): 23        |                                                                                                                   |  |
| Tested By: Kevin Rose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Relative Humidity(%): 45   |                                                                                                                   |  |
| E.U.T.: 431X Mobile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |                                                                                                                   |  |
| Configuration: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                            |                                                                                                                   |  |
| Sample Number: 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                                                                                                                   |  |
| Location: Lab 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RBW: Refer to plots        |                                                                                                                   |  |
| Detector Type: Peak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | VBW: Refer to plots        |                                                                                                                   |  |
| <b>Test Equipment Used</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                                                                                   |  |
| Antenna: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Directional Coupler: _____ |                                                                                                                   |  |
| Pre-Amp: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable #1: 1629             |                                                                                                                   |  |
| Filter: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Cable #2: _____            |                                                                                                                   |  |
| Receiver: 1036                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable #3: _____            |                                                                                                                   |  |
| Attenuator #1: 1064                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cable #4: _____            |                                                                                                                   |  |
| Attenuator #2: 1604                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mixer: _____               |                                                                                                                   |  |
| Additional equipment used: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                                                                                                                   |  |
| Measurement Uncertainty: +/-1.7 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |                                                                                                                   |  |
| <div><div><div><div>Ref Lvl<br/>43.3 dBm</div><div>Marker 1 [11]<br/>-42.07 dBm</div><div>136.02500000 MHz</div></div><div>RBW 100 Hz<br/>VBW 100 Hz<br/>SWT 25 s</div><div>RF Att 30 dB</div><div>Unit dBm</div></div><div><div>43.3</div><div>40</div><div>30</div><div>20</div><div>10</div><div>0</div><div>-10</div><div>-20</div><div>-30</div><div>-40</div><div>-50</div><div>56.7</div></div><div><div>39.6 dB Offset</div><div>1VIEW</div><div>2VIEW</div><div>902100</div><div>Center 136 MHz</div><div>5 kHz</div><div>Span 50 kHz</div></div><div><div>*</div><div>A</div><div>1MA</div><div>2MA</div></div></div> |                            |                                                                                                                   |  |
| Date: 19.JAN.2005 10:03:16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                                                                                   |  |
| Notes: 8K0F1E/8K0F1D - Mask D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |                                                                                                                   |  |
| AF Input: -7 dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                                                                                                                   |  |

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

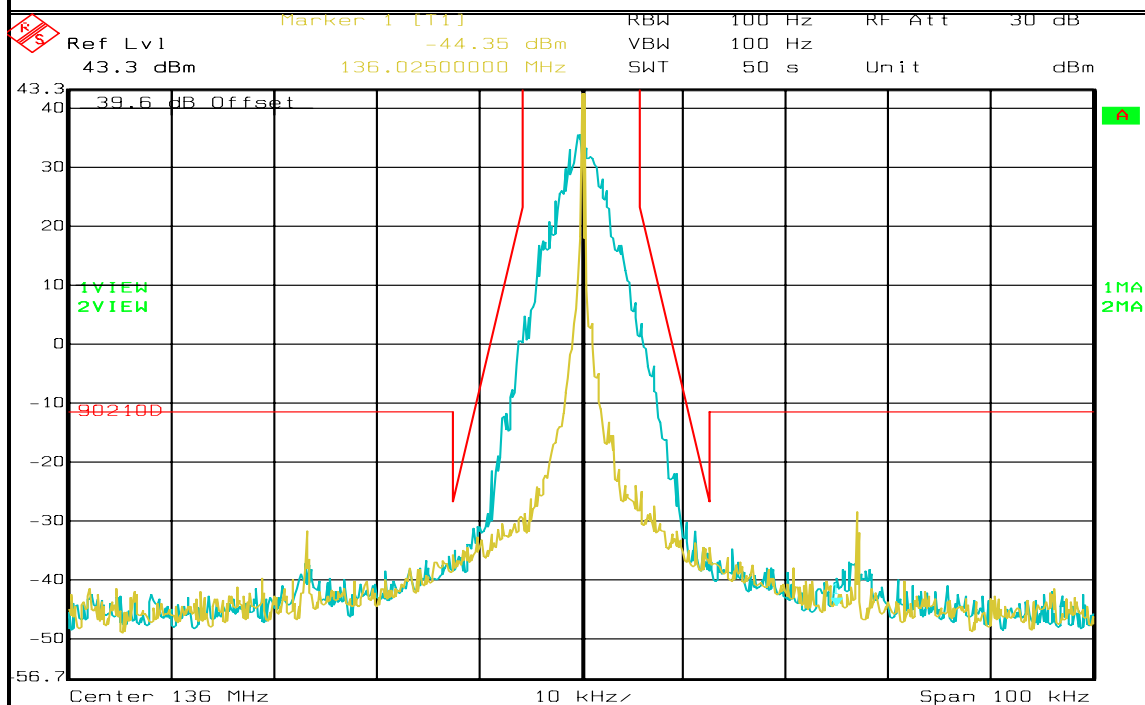
802 N. Kealy  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

Page 2 of 3

Job No.: 4L0696 Date: 1/13/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 45  
E.U.T.: 431X Mobile  
Configuration:

## Occupied Bandwidth



Date: 19.JAN.2005 10:07:40

Notes: 8K0F1E/8K0F1D - Mask D  
AF Input: -7 dBm



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

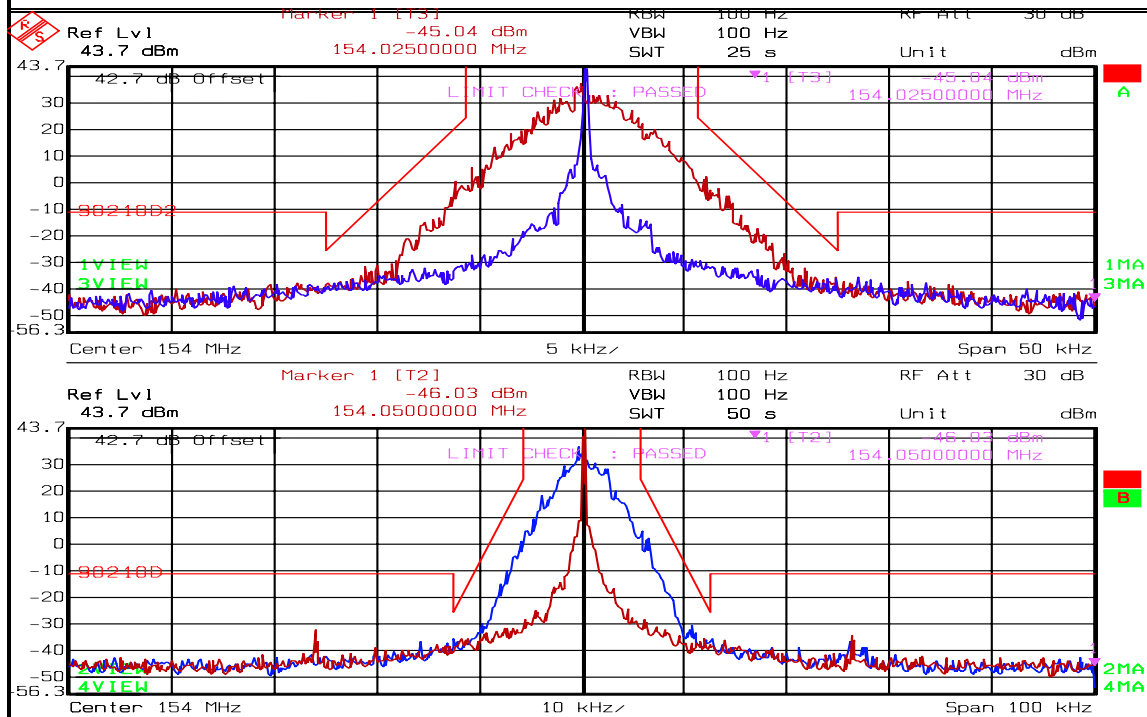
802 N. Kealy  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

Page 3 of 3

Job No.: 4L0696 Date: 1/13/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 45  
E.U.T.: 431X Mobile  
Configuration:

## Occupied Bandwidth



Notes: 8K0F1E/8K0F1D - Mask D  
AF Input: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

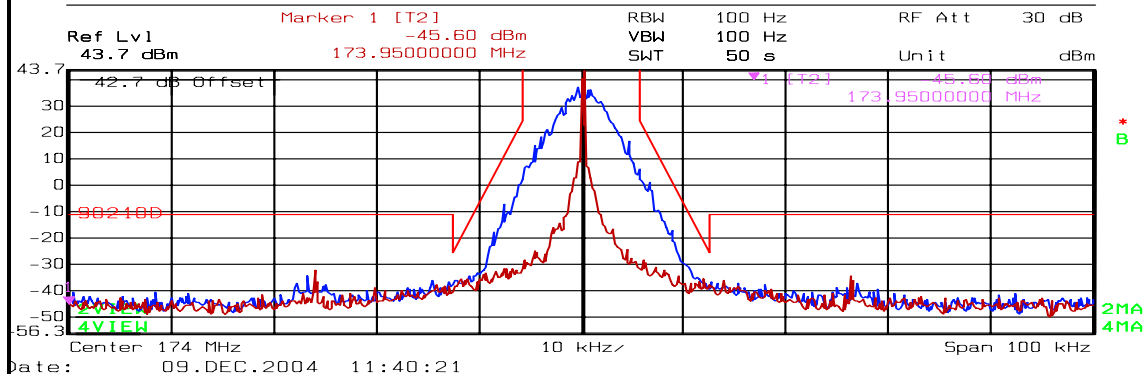
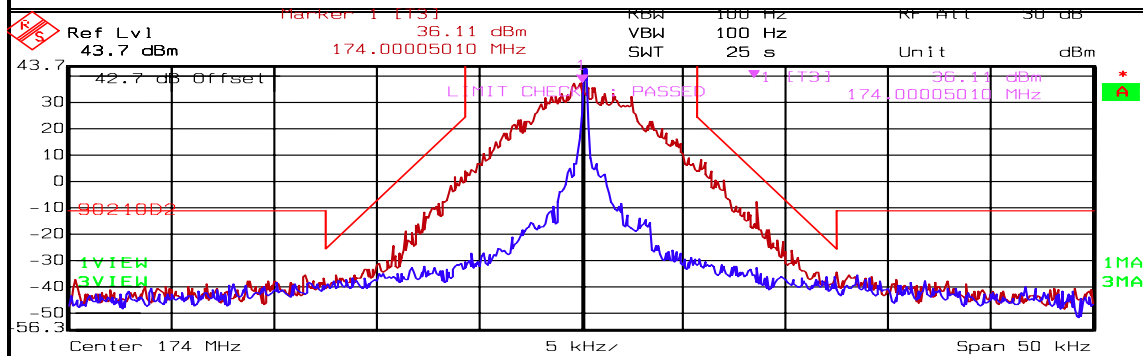
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Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

## Occupied Bandwidth

Page 4 of 3

Job No.: 4L0696 Date: 1/13/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 45  
E.U.T.: 431X Mobile  
Configuration:



Date: 09.DEC.2004 11:40:21

Notes: 174 digital

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

---

## Section 6. Spurious Emissions at Antenna Terminals

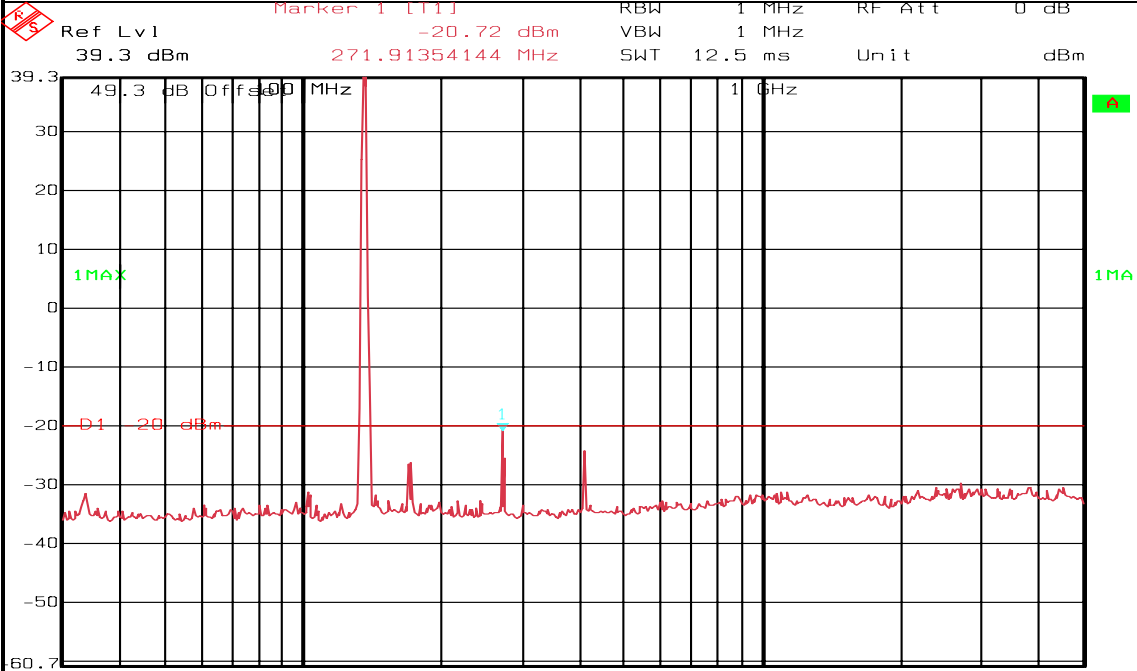
|                                                      |                    |
|------------------------------------------------------|--------------------|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 2.991   |
| TESTED BY: Kevin Rose                                | DATE: 24 Nov. 2004 |

**Measurement Results:** Complies.

**Measurement Data:** See attached data

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

|                                                                                     |                            |                                                                                                                   |  |
|-------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------|--|
|    |                            | <b>Dallas Headquarters:</b><br>802 N. Kealy<br>Lewisville, TX 75057<br>Tel: (972) 436-9600<br>Fax: (972) 436-2667 |  |
| <b>Nemko Dallas, Inc.</b>                                                           |                            |                                                                                                                   |  |
| <b>Data Plot</b>                                                                    |                            | <b>Spurious Emissions at Antenna Terminals</b>                                                                    |  |
| Page 1 of 2                                                                         |                            | Complete <u>X</u>                                                                                                 |  |
| Job No.: 4L0696                                                                     | Date: 1/12/2005            | Preliminary: _____                                                                                                |  |
| Specification: Part 90/RSS 119                                                      | Temperature(°C): 23        |                                                                                                                   |  |
| Tested By: Kevin Rose                                                               | Relative Humidity(%): 64   |                                                                                                                   |  |
| E.U.T.: 431X Mobile                                                                 |                            |                                                                                                                   |  |
| Configuration: _____                                                                |                            |                                                                                                                   |  |
| Sample Number: 1                                                                    |                            |                                                                                                                   |  |
| Location: Lab 1                                                                     | RBW: Refer to plots        |                                                                                                                   |  |
| Detector Type: Peak                                                                 | VBW: Refer to plots        |                                                                                                                   |  |
| <b>Test Equipment Used</b>                                                          |                            |                                                                                                                   |  |
| Antenna: _____                                                                      | Directional Coupler: _____ |                                                                                                                   |  |
| Pre-Amp: _____                                                                      | Cable #1: 1629             |                                                                                                                   |  |
| Filter: _____                                                                       | Cable #2: _____            |                                                                                                                   |  |
| Receiver: 1036                                                                      | Cable #3: _____            |                                                                                                                   |  |
| Attenuator #1: 1064                                                                 | Cable #4: _____            |                                                                                                                   |  |
| Attenuator #2: 1604                                                                 | Mixer: _____               |                                                                                                                   |  |
| Additional equipment used: _____                                                    |                            |                                                                                                                   |  |
| Measurement Uncertainty: +/-1.7 dB                                                  |                            |                                                                                                                   |  |
|  |                            |                                                                                                                   |  |
| Ref Lvl 39.3 dBm                                                                    |                            |                                                                                                                   |  |
| Marker 1 [111] -20.72 dBm                                                           |                            |                                                                                                                   |  |
| 271.91354144 MHz                                                                    |                            |                                                                                                                   |  |
| RBW 1 MHz                                                                           |                            |                                                                                                                   |  |
| VBW 1 MHz                                                                           |                            |                                                                                                                   |  |
| SWT 12.5 ms                                                                         |                            |                                                                                                                   |  |
| Unit dBm                                                                            |                            |                                                                                                                   |  |
| Center 387.2983346 MHz                                                              |                            |                                                                                                                   |  |
| Span 4.97 GHz                                                                       |                            |                                                                                                                   |  |
| Date: 12.JAN.2005 16:19:55                                                          |                            |                                                                                                                   |  |
| Notes: 136 DIG 8K0F1E/8K0F1D - Mask D                                               |                            |                                                                                                                   |  |
| AF Input: -7 dBm                                                                    |                            |                                                                                                                   |  |

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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## Dallas Headquarters:

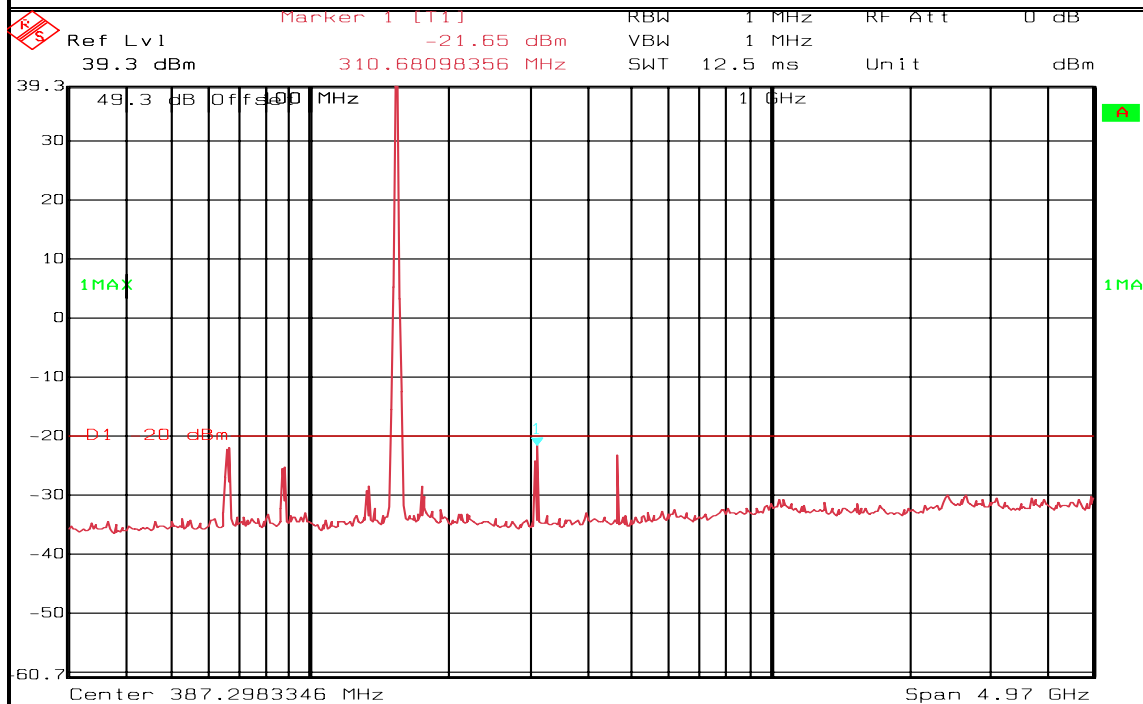
802 N. Kealy  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 2 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



Date: 12.JAN.2005 16:21:10

Notes: 154 DIG 8K0F1E/8K0F1D - Mask D  
AF Input: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

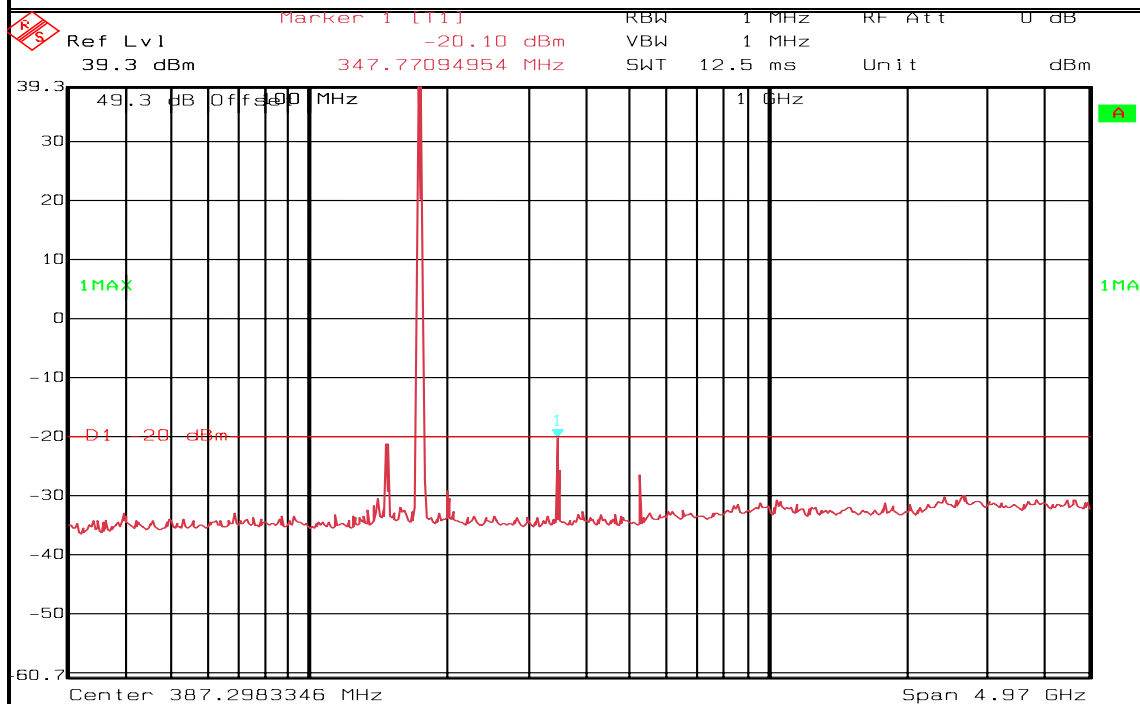
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Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 3 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



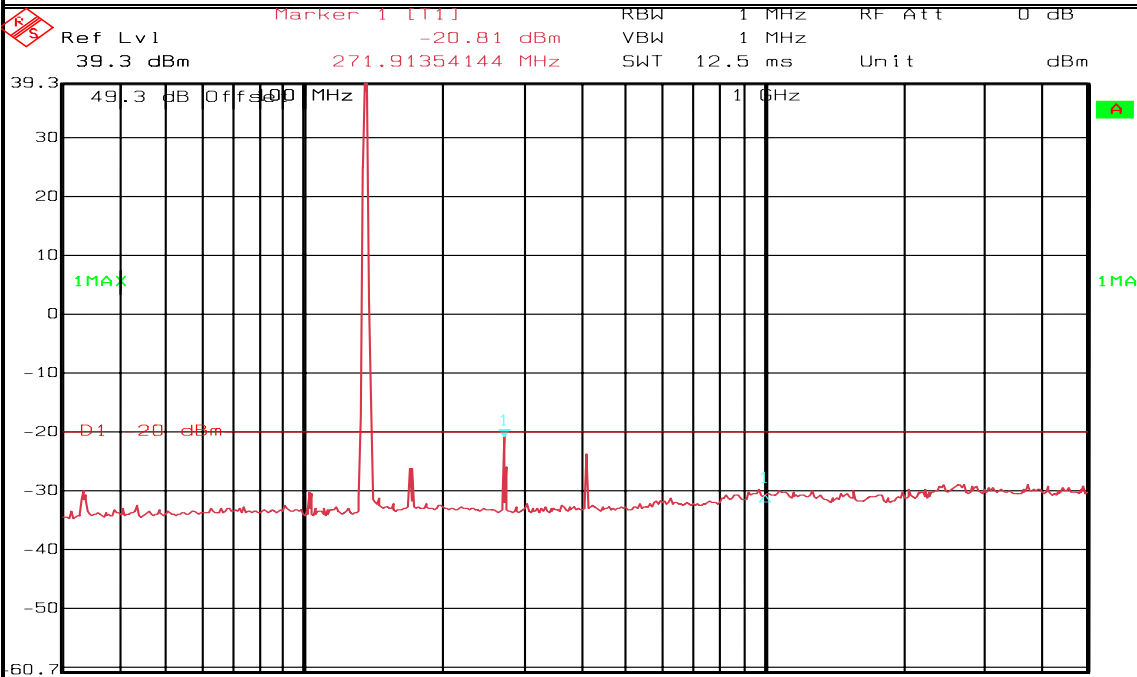
Date: 12.JAN.2005 16:22:34

Notes: 174 DIG 8K0F1E/8K0F1D - Mask D

AF Input: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

|                                                                                                                        |                         |                                                                                                                   |                                                |
|------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
|                                       |                         | <b>Dallas Headquarters:</b><br>802 N. Kealy<br>Lewisville, TX 75057<br>Tel: (972) 436-9600<br>Fax: (972) 436-2667 |                                                |
| <b>Nemko Dallas, Inc.</b>                                                                                              |                         |                                                                                                                   |                                                |
| <b>Data Plot</b>                                                                                                       |                         | <b>Spurious Emissions at Antenna Terminals</b>                                                                    |                                                |
| Page 1 of 2                                                                                                            | Job No.: 4L0696         | Date: 1/12/2005                                                                                                   | Complete <input checked="" type="checkbox"/> X |
| Specification: Part 90/RSS 119                                                                                         | Temperature(°C): 23     | Preliminary: <input type="checkbox"/>                                                                             |                                                |
| Tested By: Kevin Rose                                                                                                  | Relative Humidity(%) 64 |                                                                                                                   |                                                |
| E.U.T.: 431X Mobile                                                                                                    |                         |                                                                                                                   |                                                |
| Configuration:                                                                                                         |                         |                                                                                                                   |                                                |
| Sample Number: 1                                                                                                       |                         |                                                                                                                   |                                                |
| Location: Lab 1                                                                                                        | RBW: Refer to plots     |                                                                                                                   |                                                |
| Detector Type: Peak                                                                                                    | VBW: Refer to plots     |                                                                                                                   |                                                |
| <b>Test Equipment Used</b>                                                                                             |                         |                                                                                                                   |                                                |
| Antenna:                                                                                                               | Directional Coupler:    |                                                                                                                   |                                                |
| Pre-Amp:                                                                                                               | Cable #1: 1629          |                                                                                                                   |                                                |
| Filter:                                                                                                                | Cable #2:               |                                                                                                                   |                                                |
| Receiver: 1036                                                                                                         | Cable #3:               |                                                                                                                   |                                                |
| Attenuator #1: 1064                                                                                                    | Cable #4:               |                                                                                                                   |                                                |
| Attenuator #2: 1604                                                                                                    | Mixer:                  |                                                                                                                   |                                                |
| Additional equipment used:                                                                                             |                         |                                                                                                                   |                                                |
| Measurement Uncertainty: +/-1.7 dB                                                                                     |                         |                                                                                                                   |                                                |
|                                     |                         |                                                                                                                   |                                                |
| Ref Lvl 39.3 dBm    -20.81 dBm    271.91354144 MHz    RBW 1 MHz    RF Att 0 dB    VBW 1 MHz    Unit dBm    SWT 12.5 ms |                         |                                                                                                                   |                                                |
| Center 387.2983346 MHz    Span 4.97 GHz                                                                                |                         |                                                                                                                   |                                                |
| Date: 12.JAN.2005 16:08:10                                                                                             |                         |                                                                                                                   |                                                |
| Notes: 136 MHz Wideband - 16K0F3E                                                                                      |                         |                                                                                                                   |                                                |
| AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz                                                        |                         |                                                                                                                   |                                                |
| AF level: -7 dBm                                                                                                       |                         |                                                                                                                   |                                                |

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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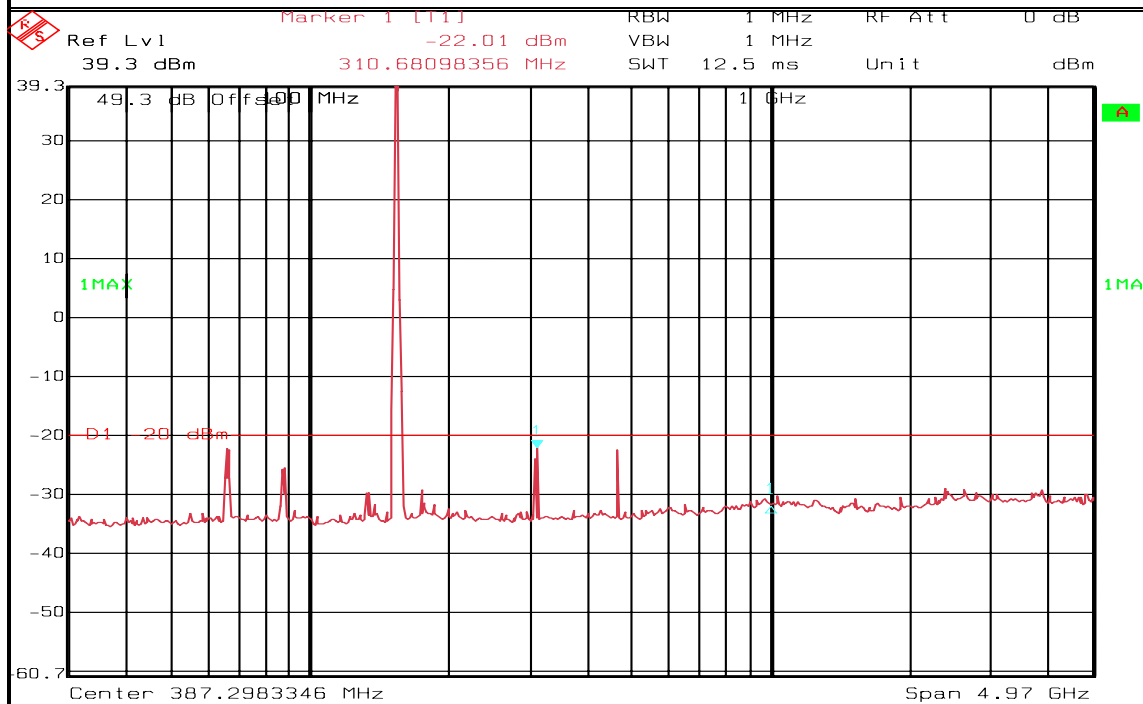
802 N. Kealy  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

Page 2 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:

## Spurious Emissions at Antenna Terminals



Notes: 154 MHz Wideband - 16K0F3E

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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## Dallas Headquarters:

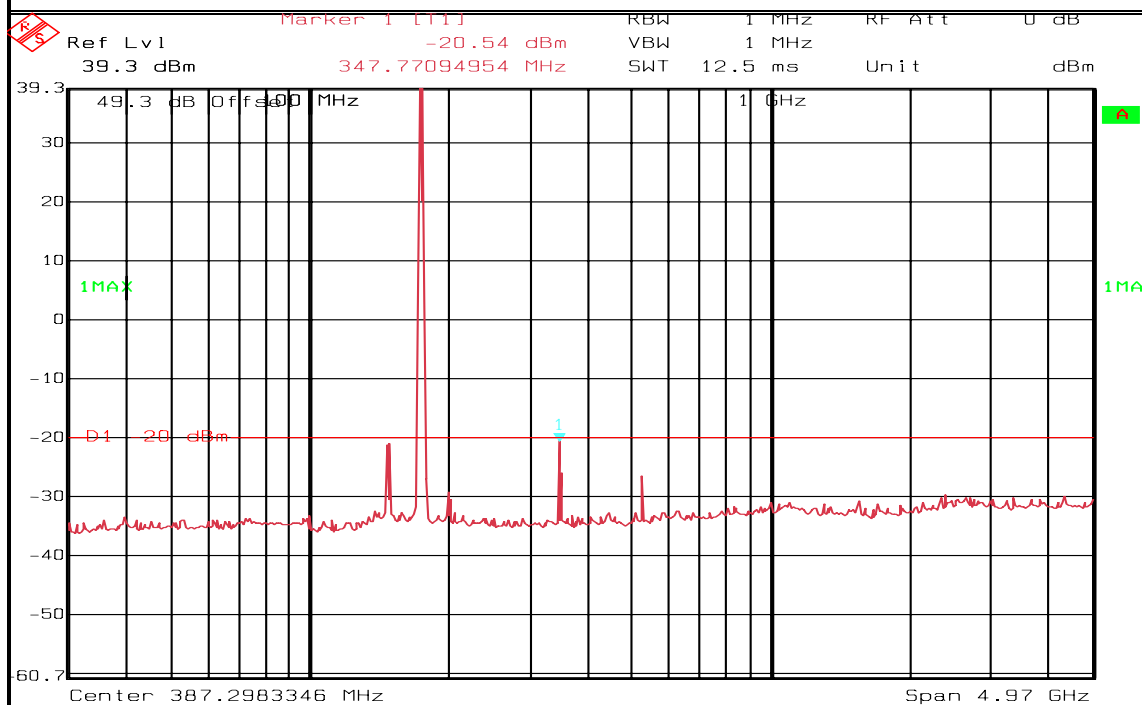
802 N. Kealy  
Lewisville, TX 75057  
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Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 3 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



Date: 12.JAN.2005 16:13:45

Notes: 174 MHz Wideband - 16K0F3E

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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## Dallas Headquarters:

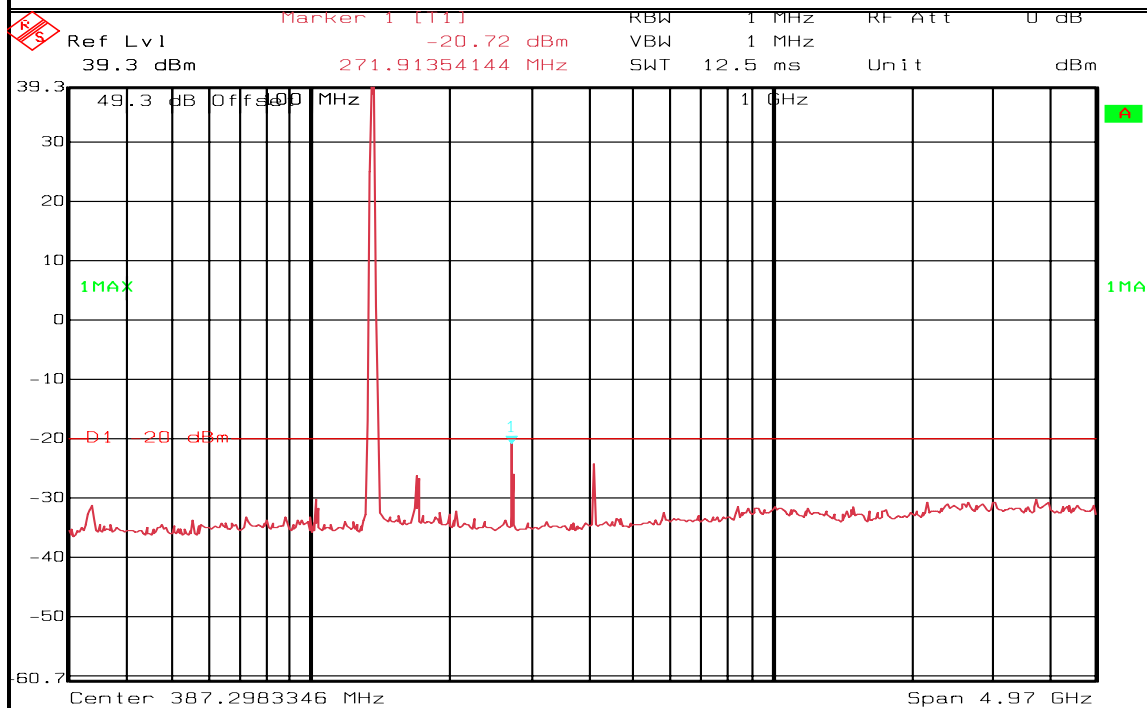
802 N. Kealy  
Lewisville, TX 75057  
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Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 4 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



Date: 12 JAN 2005 16:15:44

Notes: 136MHZ NB 11K0F3E - Mask D

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

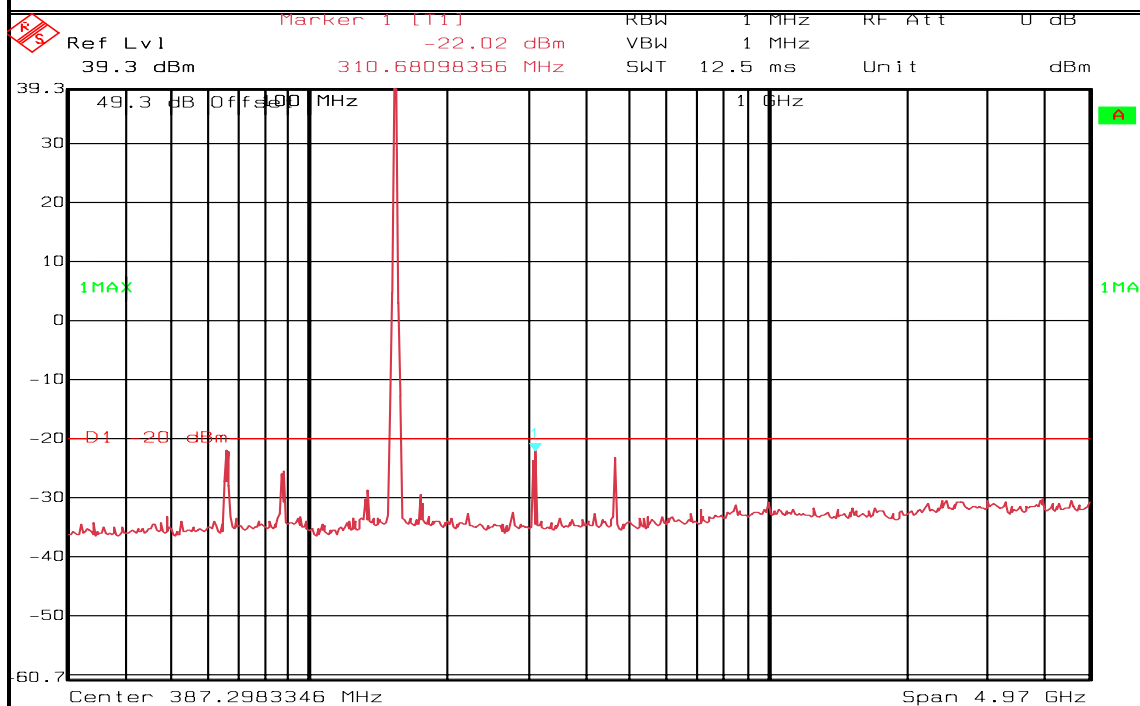
802 N. Kealy  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 5 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



Date: 12.JAN.2005 16:16:45

Notes: 154 NB 11K0F3E - Mask D

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Nemko Dallas, Inc.

## Dallas Headquarters:

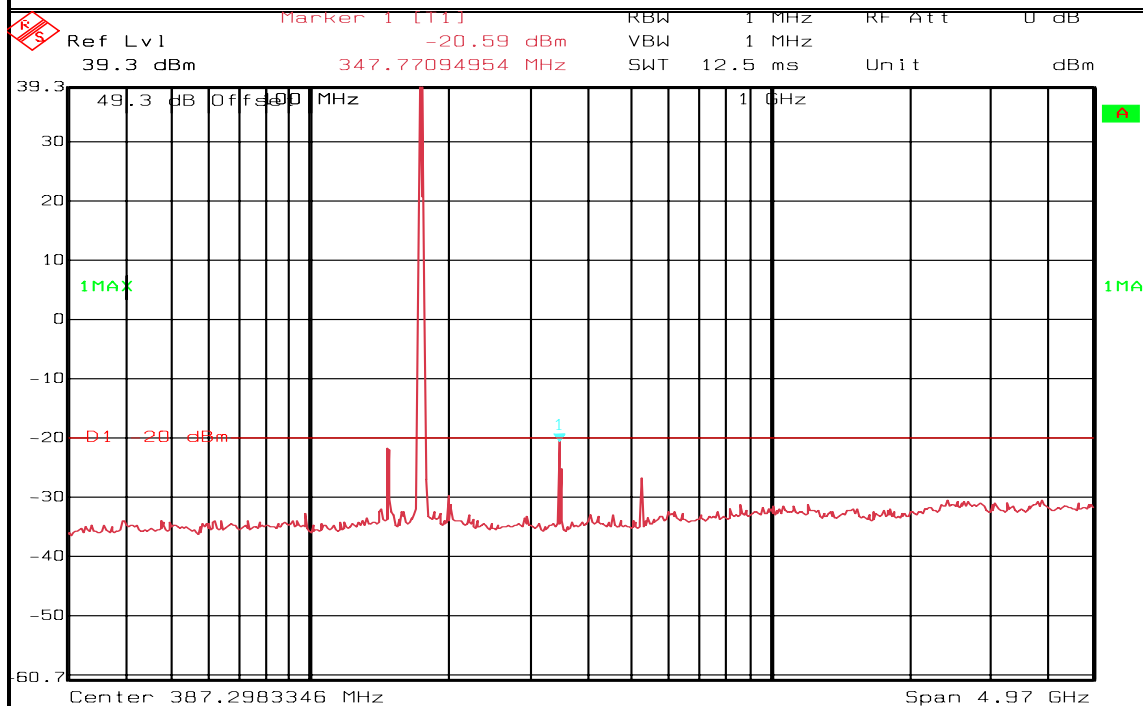
802 N. Kealy  
Lewisville, TX 75057  
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Fax: (972) 436-2667

## Data Plot

## Spurious Emissions at Antenna Terminals

Page 6 of 9

Job No.: 4L0696 Date: 1/12/2005  
Specification: Part 90/RSS 119 Temperature(°C): 23  
Tested By: Kevin Rose Relative Humidity(%) 64  
E.U.T.: 431X Mobile  
Configuration:



Date: 12 JAN 2005 16:17:48

Notes: 174 NB 11K0F3E - Mask D

AF Input: 2.5 kHz tone at 16db above nominal deviation at 1 kHz

AF level: -7 dBm

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

---

## Section 7. Field Strength of Spurious Emissions

|                                                    |                    |
|----------------------------------------------------|--------------------|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 2.993   |
| TESTED BY: Kevin Rose                              | DATE: 10 JAN. 2005 |

**Measurement Results:** Complies.

**Measurement Data:** See attached data

**Note:** The frequency spectrum was searched from 10 MHz up to 10 GHz. All emissions within 20 dB of the specification limit are reported.

PROJECT NO.: 4L0696RUS1

[illegible]

PROJECT NO.: 4L0696RUS1

EUT was scanned from 30MHz to 1GHz

## Photographs of Test Setup

### FRONT VIEW



### REAR VIEW





*EQUIPMENT:*    **431x VHF Transceiver**

PROJECT NO.:    **4L0696RUS1**

---

## **Section 8.            Frequency Stability**

|                                   |                    |
|-----------------------------------|--------------------|
| NAME OF TEST: Frequency Stability | PARA. NO.: 2.995   |
| TESTED BY: Kevin Rose             | DATE: 14 DEC. 2004 |

**Measurement Results:**        Complies.

**Measurement Data:**            See attached data

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

|  |                          | <b>Dallas Headquarters:</b><br>802 N. Kealy<br>Lewisville, TX 75057<br>Tel: (972) 436-9600<br>Fax: (972) 436-2667 |              |                      |               |             |         |
|-----------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------|--------------|----------------------|---------------|-------------|---------|
| <b>Nemko Dallas, Inc.</b>                                                         |                          |                                                                                                                   |              |                      |               |             |         |
| <b><u>Frequency Stability</u></b>                                                 |                          |                                                                                                                   |              |                      |               |             |         |
| Page <u>1</u> of <u>1</u>                                                         |                          |                                                                                                                   |              |                      |               |             |         |
| Job No.: 4L0696                                                                   |                          | Date: 12/8/2004                                                                                                   |              |                      |               |             |         |
| Specification: Pt90                                                               |                          | Temperature(°C): <u>20</u>                                                                                        |              |                      |               |             |         |
| Tested By: Kevin Rose                                                             |                          | Relative Humidity(%) <u>45</u>                                                                                    |              |                      |               |             |         |
| E.U.T.: 431X Mobile Radio                                                         |                          |                                                                                                                   |              |                      |               |             |         |
| Configuration: Tx                                                                 |                          |                                                                                                                   |              |                      |               |             |         |
| Sample Number: <u>1</u>                                                           |                          |                                                                                                                   |              |                      |               |             |         |
| <b><u>Test Equipment Used</u></b>                                                 |                          |                                                                                                                   |              |                      |               |             |         |
| Antenna: _____                                                                    |                          | Chamber <u>283</u>                                                                                                |              |                      |               |             |         |
| Pre-Amp: _____                                                                    |                          | Cable #1: _____                                                                                                   |              |                      |               |             |         |
| Filter: _____                                                                     |                          | Cable #2: _____                                                                                                   |              |                      |               |             |         |
| Receiver: <u>1036</u>                                                             |                          | Thermometer <u>619</u>                                                                                            |              |                      |               |             |         |
| Attenuator #1 <u>1064</u>                                                         |                          |                                                                                                                   |              |                      |               |             |         |
| Attenuator #2: <u>1604</u>                                                        |                          |                                                                                                                   |              |                      |               |             |         |
| Measurement Uncertainty: <u>1x10<sup>-7</sup> ppm</u>                             |                          |                                                                                                                   |              |                      |               |             |         |
| Standard Test Frequency <u>154.000344</u> MHz                                     |                          |                                                                                                                   |              |                      |               |             |         |
| Temp (°C)                                                                         | Measured Frequency (MHz) | Rho                                                                                                               | Test Voltage | Frequency Error (Hz) | Limit (+/-Hz) | Error (ppm) | Comment |
| 20                                                                                | 154.000344               |                                                                                                                   | 13.3         | 0                    | 308.0         | 0           |         |
| 20                                                                                | 154.000344               |                                                                                                                   | 15.3         | 0                    | 308.0         | 0.0         |         |
| 20                                                                                | 154.000344               |                                                                                                                   | 11.3         | 0                    | 308.0         | 0.0         |         |
| 50                                                                                | 154.000282               |                                                                                                                   | 13.3         | -62                  | 308.0         | -0.4        |         |
| 40                                                                                | 154.000172               |                                                                                                                   | 13.3         | -172                 | 308.0         | -1.1        |         |
| 30                                                                                | 154.000141               |                                                                                                                   | 13.3         | -203                 | 308.0         | -1.3        |         |
| 10                                                                                | 154.000407               |                                                                                                                   | 13.3         | 63                   | 308.0         | 0.4         |         |
| 0                                                                                 | 154.000532               |                                                                                                                   | 13.3         | 188                  | 308.0         | 1.2         |         |
| -10                                                                               | 154.000540               |                                                                                                                   | 13.3         | 196                  | 308.0         | 1.3         |         |
| -20                                                                               | 154.000548               |                                                                                                                   | 13.3         | 204                  | 308.0         | 1.3         |         |
| -30                                                                               | 154.000490               |                                                                                                                   | 13.3         | 146                  | 308.0         | 0.9         |         |
| Notes:                                                                            |                          |                                                                                                                   |              |                      |               |             |         |

*EQUIPMENT:*    **431x VHF Transceiver**

PROJECT NO.:    **4L0696RUS1**

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## **Section 9.            Transient Frequency Behavior**

|                                            |                    |
|--------------------------------------------|--------------------|
| NAME OF TEST: Transient Frequency Behavior | PARA. NO.: 90.214  |
| TESTED BY: Kevin Rose                      | DATE: 10 DEC. 2004 |

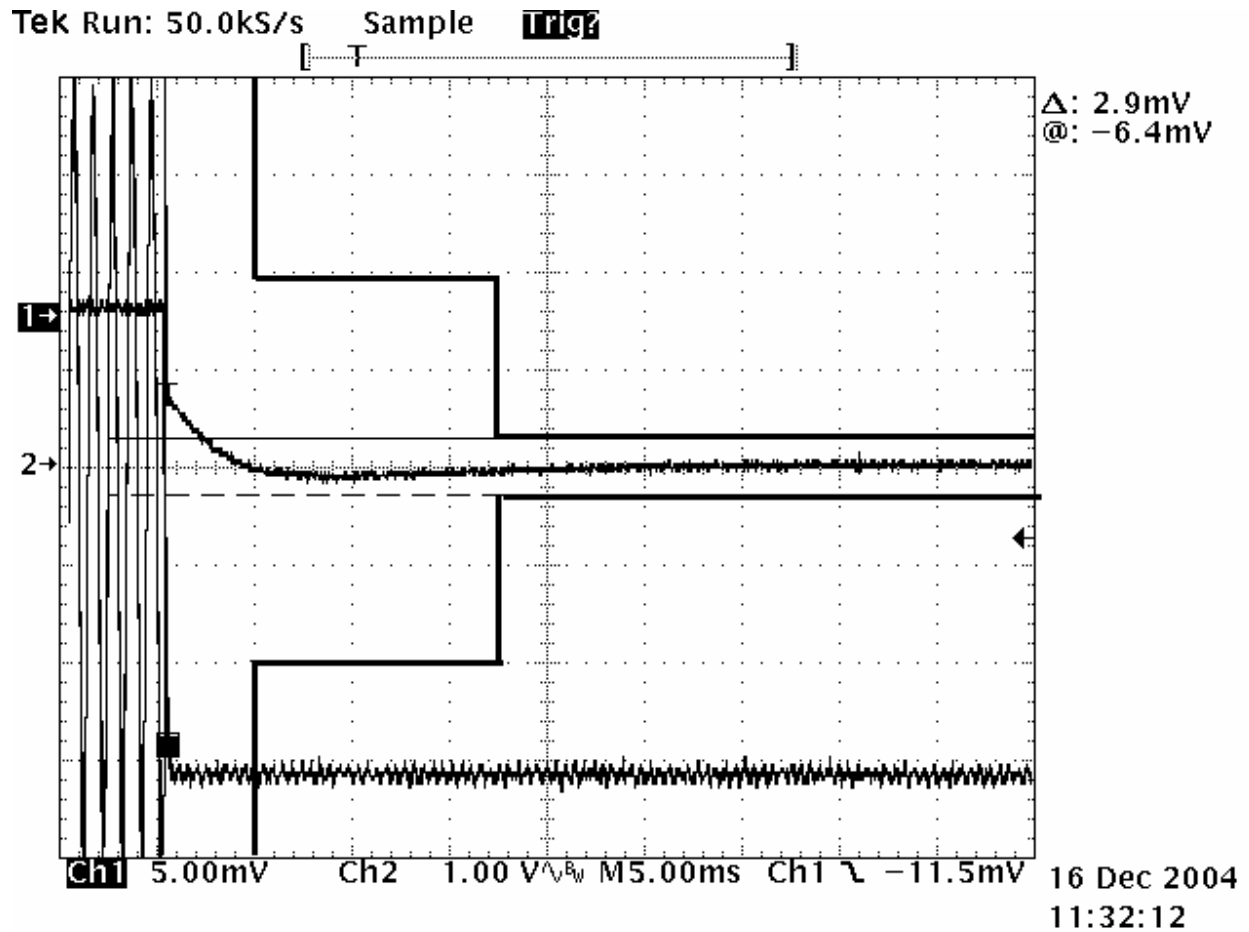
**Measurement Results:**        Complies.

**Measurement Data:**            See attached data

**Measurement Conditions:**        Temperature:    **23** °C  
                                                 Humidity:        **48** %

EQUIPMENT: 431x VHF Transceiver

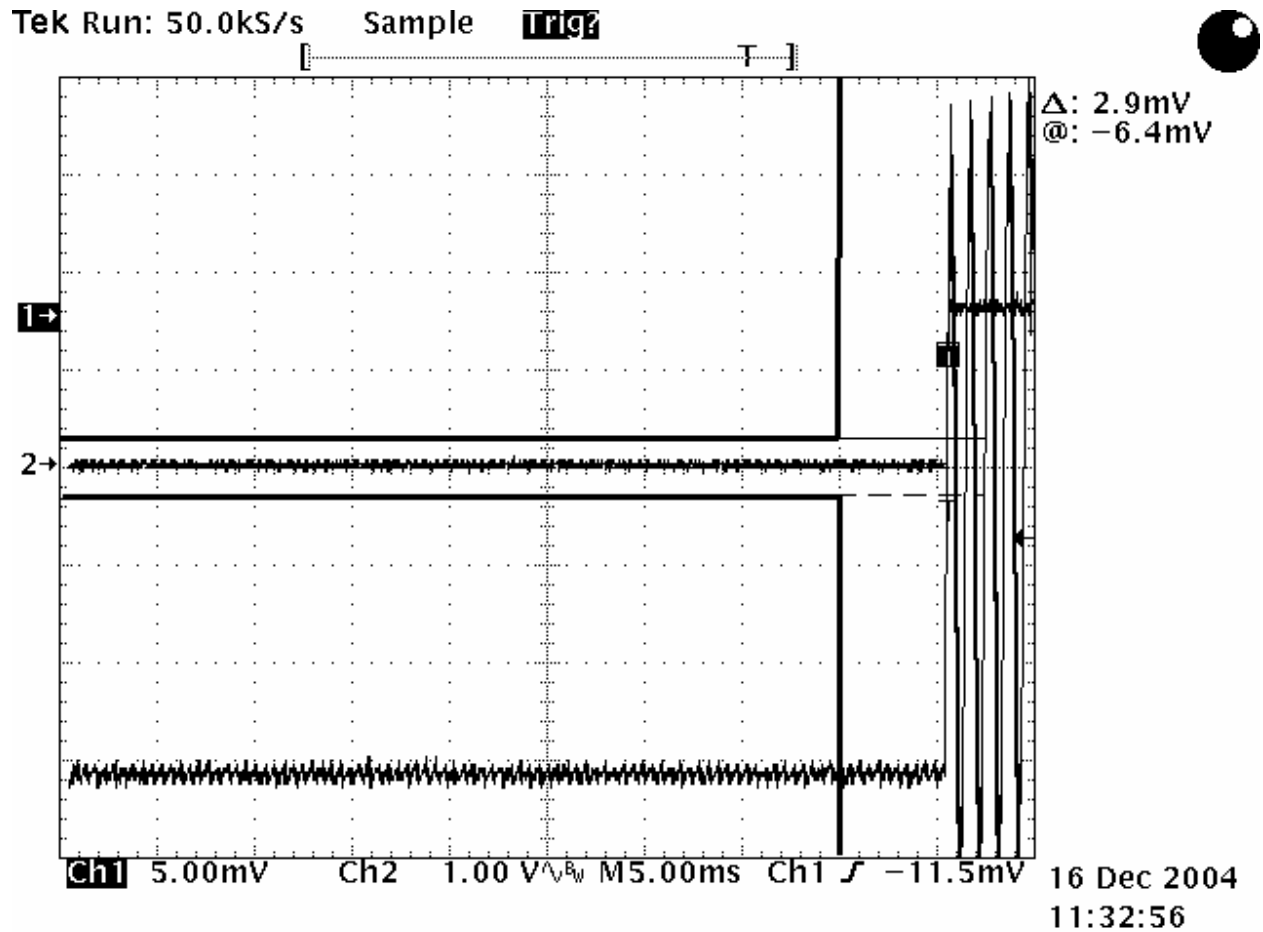
PROJECT NO.: 4L0696RUS1



Switch on Condition – 12.5 kHz Channel Spacing

EQUIPMENT: 431x VHF Transceiver

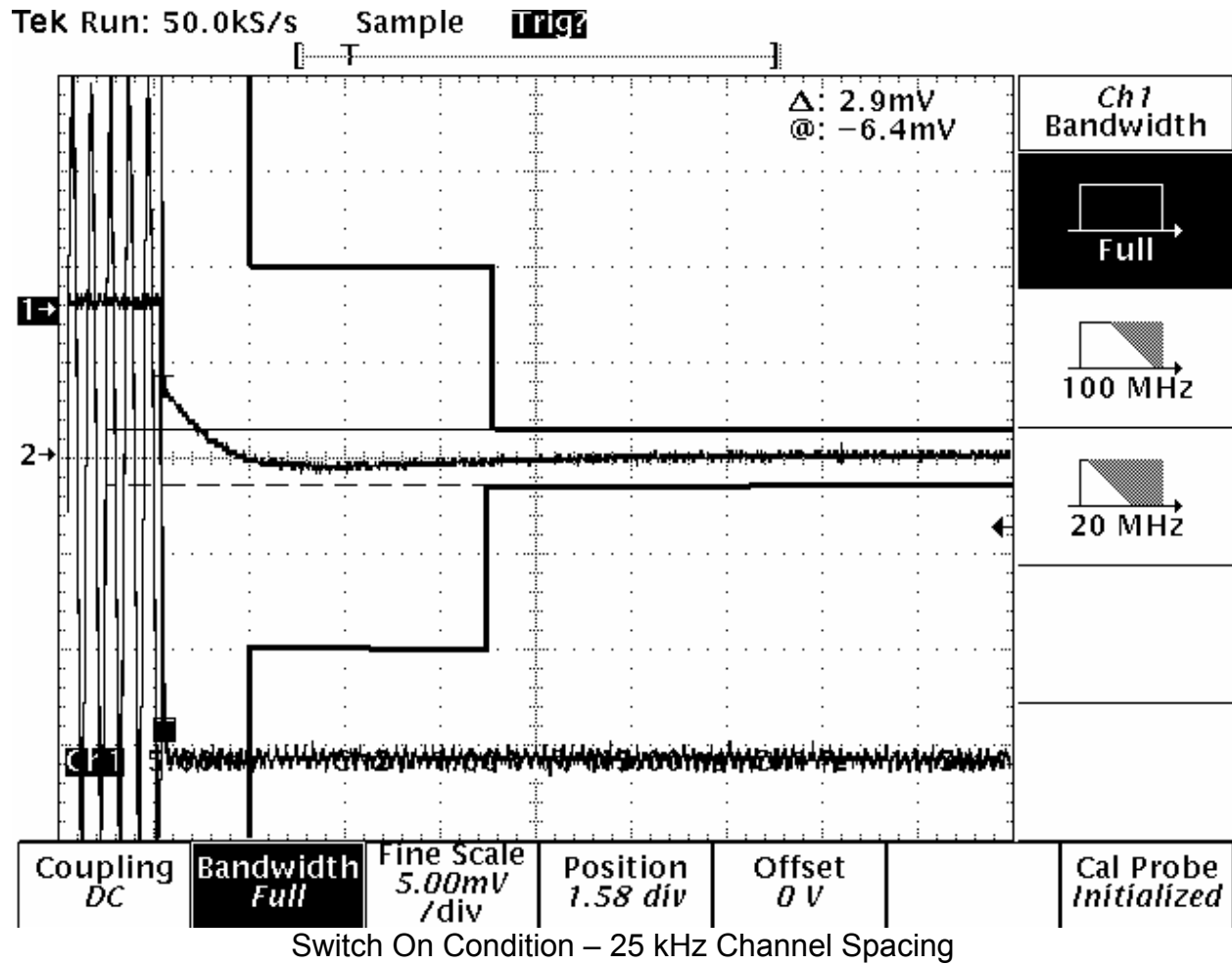
PROJECT NO.: 4L0696RUS1



Switch off Condition – 12.5 kHz Channel Spacing

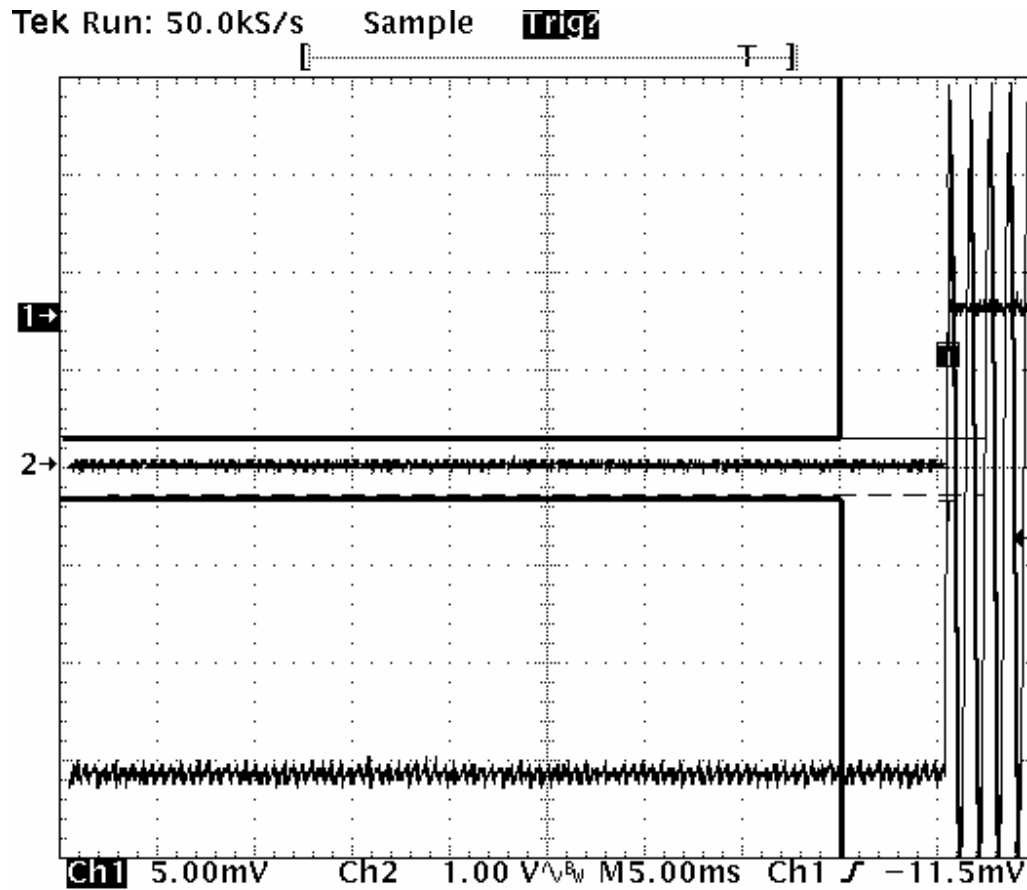
EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



Switch Off Condition – 25 kHz Channel Spacing

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

**Section 10. Test Equipment List**

| Nemko ID | Description                     | Manufacturer<br>Model Number | Serial Number | Calibration<br>Date | Calibration<br>Due |
|----------|---------------------------------|------------------------------|---------------|---------------------|--------------------|
| 2072     | Power Meter                     | HP<br>E4418B                 | GB39401848    | 03/12/04            | 03/12/05           |
| 2071     | Power Sensor                    | Agilent<br>E9304A            | MY41495174    | n/a                 | n/a                |
| 1048     | 50 OHM LOAD                     | NARDA<br>27470               | 254           | Cal B4 Use          | N/A                |
| 1064     | ATTENUATOR                      | NARDA<br>776B-20             | NONE          | CBU                 | N/A                |
| 1036     | SPECTRUM<br>ANALYZER            | ROHDE & SCHWARZ<br>FSEK30    | 830844/006    | 03/22/04            | 03/23/06           |
| 1469     | 10 db Attenuator DC 18<br>GHz   | MCL Inc.<br>BW-S10W2 10db    | NONE          | CBU                 | N/A                |
| 1054     | DUAL DIRECTIONAL<br>COUPLER     | NARDA<br>3020A               | 34366         | Cal Not Req         | N/A                |
| 1629     | CABLE, 6 ft                     | MEGAPHASE<br>10311 1GVT4     | N/A           | CBU                 | N/A                |
| 1304     | HORN ANTENNA                    | ELECTRO METRICS<br>RGA-60    | 6151          | 09/22/03            | 09/22/05           |
| 1464     | Spectrum analyzer               | Hewlett Packard<br>8563E     | 3551A04428    | 07/30/04            | 07/31/06           |
| 1483     | Cable 4m                        | Storm<br>PR90-010-144        | N/A           | 04/14/04            | 04/13/05           |
| 1484     | Cable 2.0-18.0 Ghz              | Storm<br>PR90-010-072        | N/A           | 08/26/04            | 08/26/05           |
| 1026     | FREQUENCY<br>COUNTER            | HEWLETT PACKARD<br>5350B     | 8232A01493    | 01/23/04            | 01/22/05           |
| 1051     | Radio Communication<br>Analyzer | Rhode & Schwarz<br>CMTA-54   | 835875/002    | 03/12/04            | 03/12/05           |
| 1053     | SIGNAL GENERATOR                | ROHDE & SCHWARZ<br>SMIQ 03   | DE22081       | 06/10/04            | 06/09/05           |
| 765      | RECEIVER (20-1000<br>MHz)       | ROHDE & SCHWARZ<br>ESVS 30   | 843710/0001   | 09/12/04            | 09/11/05           |
| 616      | Oscilloscope digital<br>storage | Tektronix<br>468             | B033169       | 10/11/04            | 10/11/05           |
| 981      | Antenna, Loop                   | Rohde&Schwarz<br>HFH2-Z2     | 871336/20     | Cal Not Req         | N/A                |



## **ANNEX A - TEST METHODOLOGIES**

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

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|                                      |                         |
|--------------------------------------|-------------------------|
| <b>NAME OF TEST: RF Power Output</b> | <b>PARA. NO.: 2.985</b> |
|--------------------------------------|-------------------------|

**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.

*EQUIPMENT:*    **431x VHF Transceiver**PROJECT NO.:    **4L0696RUS1**

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**NAME OF TEST: Audio Frequency Response****PARA. NO.: 2.987(a)****Test Method:**                      TIA/EIA-603**Minimum Standard:**            TIA/EIA-603, Para. 3.2.6 from 300 Hz to 3000 Hz. The transmitter audio frequency response shall have a nominal 6 dB per octave pre-emphasis characteristic.**NAME OF TEST: Audio Low-Pass Filter Frequency Response****PARA. NO.: 2.987(a)****Test Method:**                      TIA/EIA-603**Minimum Standard:**            TIA/EIA-603**NAME OF TEST: Modulation Limiting****PARA. NO.: 2.987(a)****Test Method:**                      TIA/EIA-603**Minimum Standard:**            TIA/EIA-603

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

**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                                          |

**Test Method:**

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

VBW:  $\Rightarrow$  RBW

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

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*EQUIPMENT:*    **431x VHF Transceiver**PROJECT NO.:    **4L0696RUS1**

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|                                                 |                         |
|-------------------------------------------------|-------------------------|
| <b>NAME OF TEST: Field Strength of Spurious</b> | <b>PARA. NO.: 2.993</b> |
|-------------------------------------------------|-------------------------|

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

**Test Method:**                    The substitution antenna method was used to measure erp of spurious emissions. This method is described in EIA/TIA 603. The field strength of the emission is measured and recorded. The EUT is then replaced with a substitution antenna of known gain against a dipole. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The erp of the spurious signal is the level required to repeat the previously measured level. If the substitution antenna gain is calibrated and expressed as dBi (referenced to an isotropic radiator instead of a dipole), the result is adjusted by 2.15 dB so that the result is erp not eirp.

*EQUIPMENT:* 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

**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           | -                       | -                 | -                 |

**NAME OF TEST: Transient Frequency Behaviour****PARA. NO.: 2.214****Minimum Standard:****Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels**

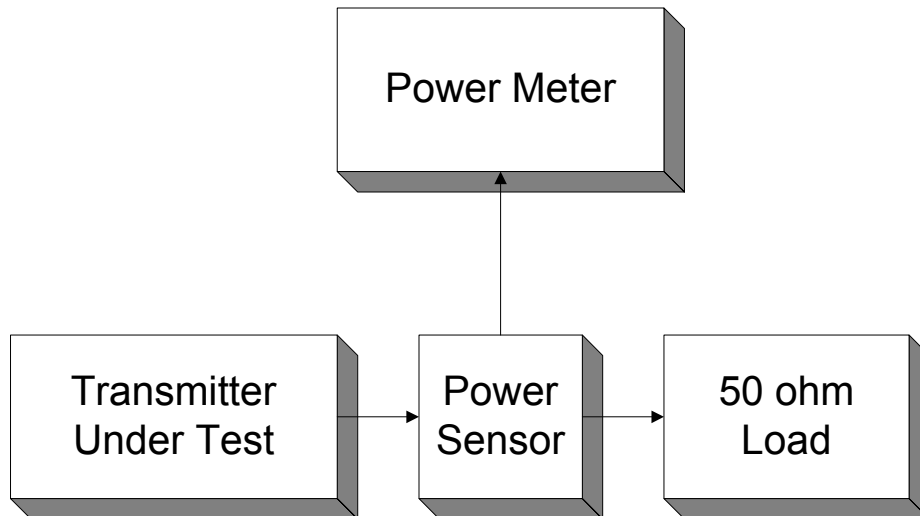
|                               | Maximum                                 | Frequency ranges (MHz) All equipment |                |                |                |                |                |
|-------------------------------|-----------------------------------------|--------------------------------------|----------------|----------------|----------------|----------------|----------------|
|                               |                                         | Base station and portable radios     |                |                | Mobile Radios  |                |                |
| Time intervals <sup>1,2</sup> | Frequency difference <sup>3</sup> (kHz) | 150 - 174 (ms)                       | 450 - 500 (ms) | 500 - 512 (ms) | 150 - 174 (ms) | 450 - 500 (ms) | 500 - 512 (ms) |
| t <sub>1</sub> <sup>4</sup>   | ± 25                                    | 5.0                                  | 10.0           | 20.0           | 5.0            | 10.0           | 5.0            |
| t <sub>2</sub>                | ± 12                                    | 20.0                                 | 25.0           | 50.0           | 20.0           | 25.0           | 20.0           |
| t <sub>3</sub> <sup>4</sup>   | ± 25                                    | 5.0                                  | 10.0           | 10.0           | 5.0            | 10.0           | 5.0            |

**Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels**

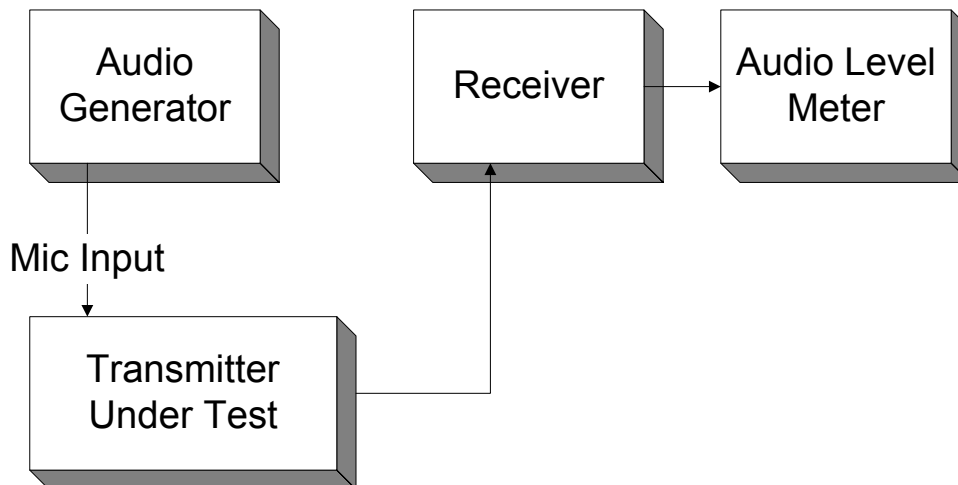
|                               | Maximum                                 | Frequency ranges (MHz) All equipment |                |                |
|-------------------------------|-----------------------------------------|--------------------------------------|----------------|----------------|
|                               |                                         | 150 - 174 (ms)                       | 450 - 500 (ms) | 500 - 512 (ms) |
| Time intervals <sup>1,2</sup> | Frequency difference <sup>3</sup> (kHz) |                                      |                |                |
| t <sub>1</sub> <sup>4</sup>   | ± 12.5 / ± 6.25                         | 5.0                                  | 10.0           | 20.0           |
| t <sub>2</sub>                | ± 6.25 / ± 3.125                        | 20.0                                 | 25.0           | 50.0           |
| t <sub>3</sub> <sup>4</sup>   | ± 12.5 / ± 6.25                         | 5.0                                  | 10.0           | 10.0           |

## **ANNEX B - TEST DIAGRAMS**

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

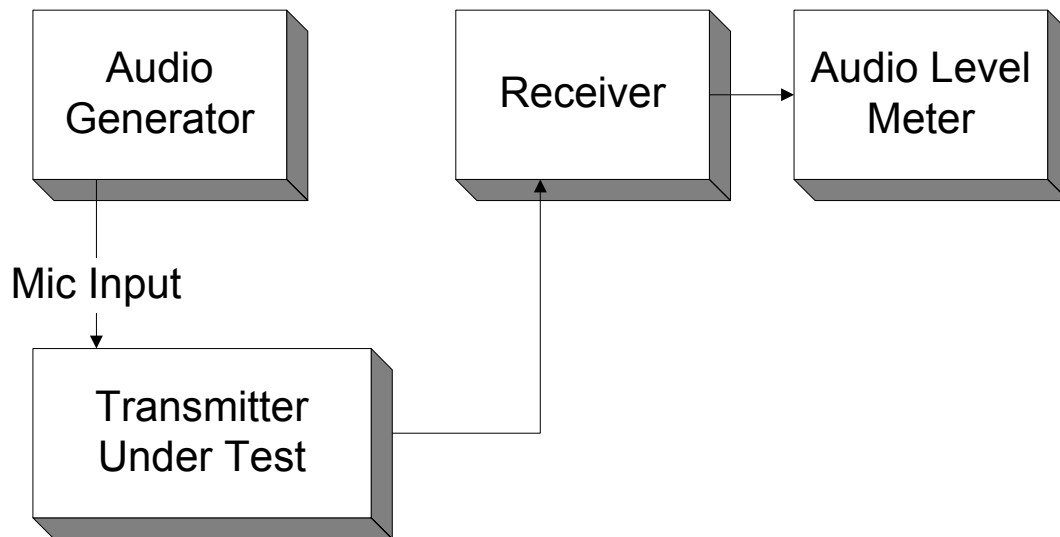


**Para. No. 2.987(a) - Audio Frequency Response**

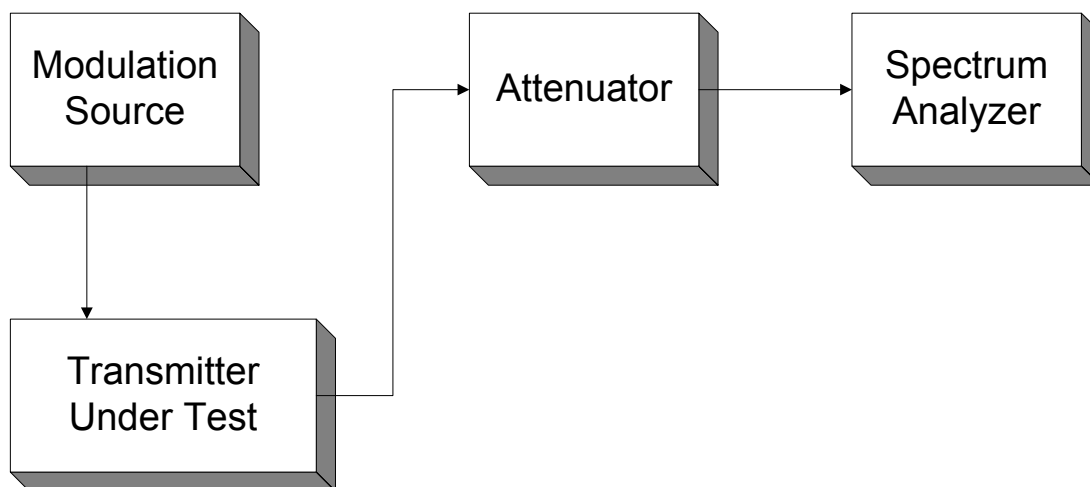




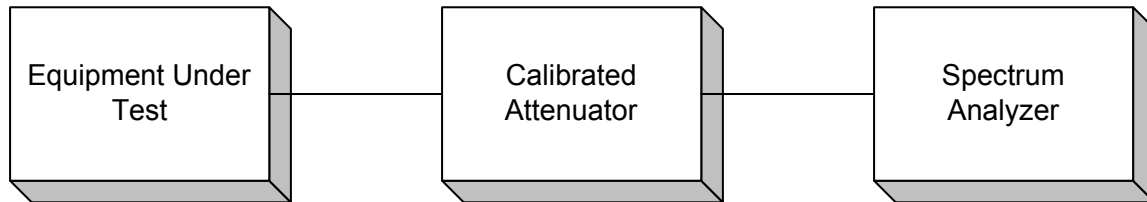
**Para. No. 2.987(b) - Modulation Limiting**



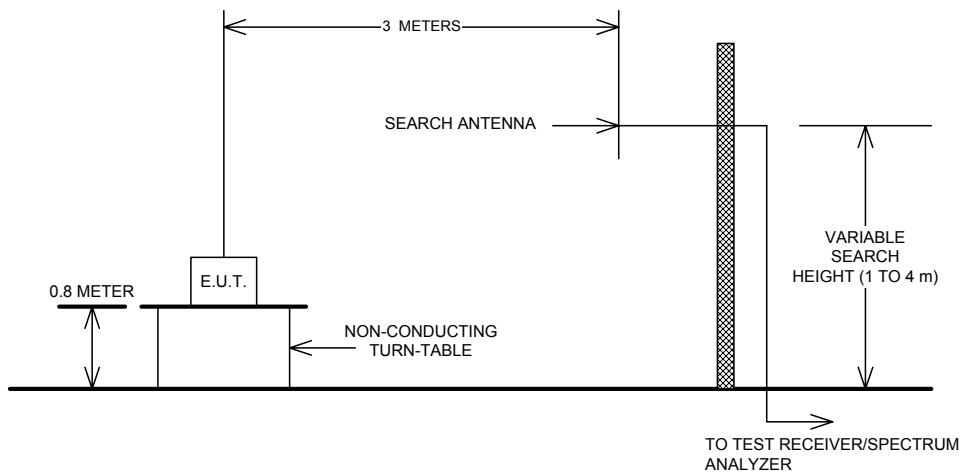
**Para. No. 2.989 - Occupied Bandwidth**



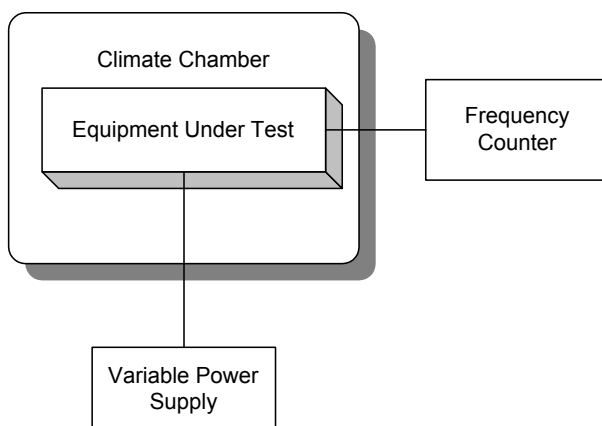
**Para. No. 2.991 - Spurious Emissions at Antenna Terminals**

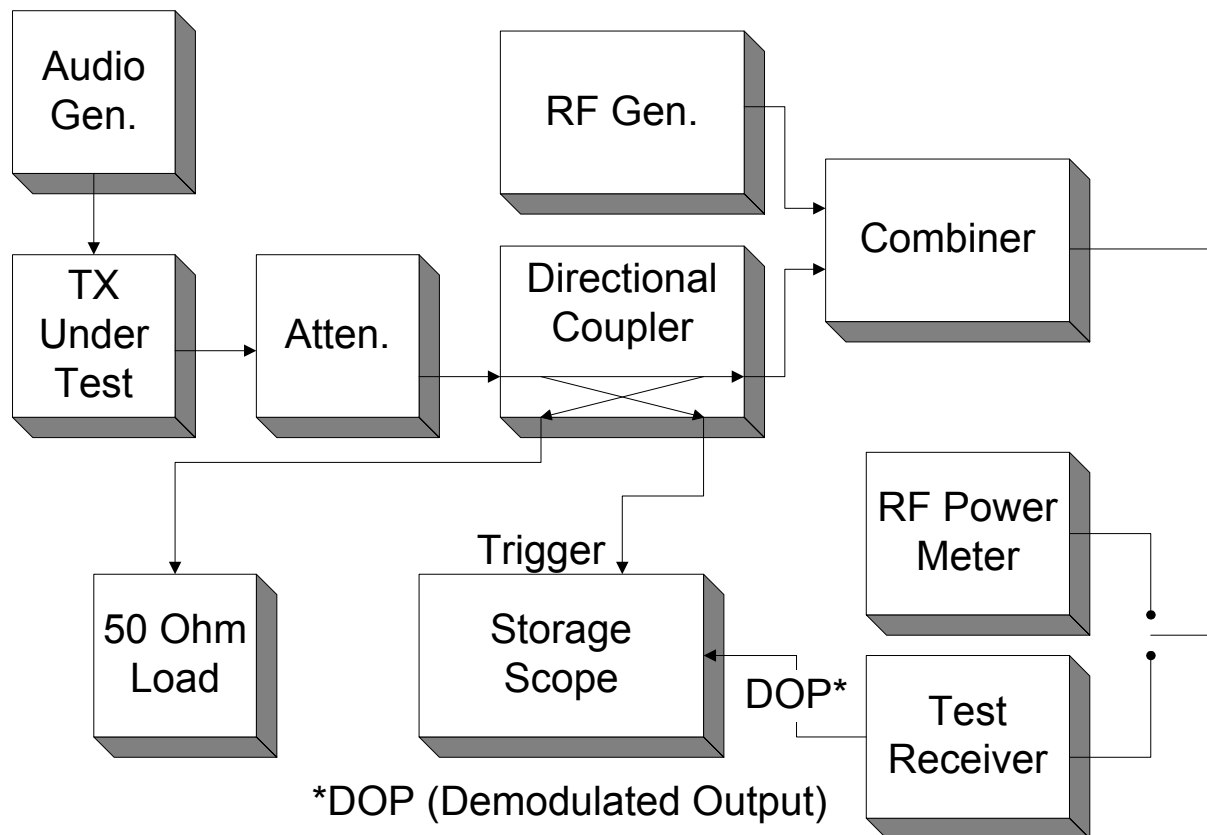


**Para. No. 2.993 - Field Strength of Spurious Radiation**



**Para. No. 2.995 - Frequency Stability**



**Para. No. 90.214 - Transient Frequency Behaviour****Voice**

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

**Data**

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).