

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

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

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**

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 (Voice)</td><td>F1D</td><td>F2D</td><td>D7W (QAM)</td><td>Other</td></tr><tr><td>☒</td><td>☒</td><td>☐</td><td>☐</td><td>☐</td></tr></table>	F3E (Voice)	F1D	F2D	D7W (QAM)	Other	☒	☒	☐	☐	☐
F3E (Voice)	F1D	F2D	D7W (QAM)	Other							
☒	☒	☐	☐	☐							
Internal/External Data Source:	Internal (Vocoded voice)										
Emission Designator:	8K10F1E, 8K10F1D 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**

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

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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 style="font-size: 2em; vertical-align: middle;">Nemko Nemko USA		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667					
<u>RF Power Output (Conducted)</u>							
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 ▼							
<u>Test Equipment Used:</u>							
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 _{nom}	V _{nom}	18.7	22.9	21.4	-0.29	0.59	0.29
	V _{min}	16.8	20.7	19.7	-0.75	0.14	-0.07
	V _{max}	19.2	23.1	21.6	-0.17	0.62	0.34
T _{min}	V _{nom}	-	-	-			
	V _{min}	-	-	-			
	V _{max}	-	-	-			
T _{max}	V _{nom}	-	-	-			
	V _{min}	-	-	-			
	V _{max}	-	-	-			
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**

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

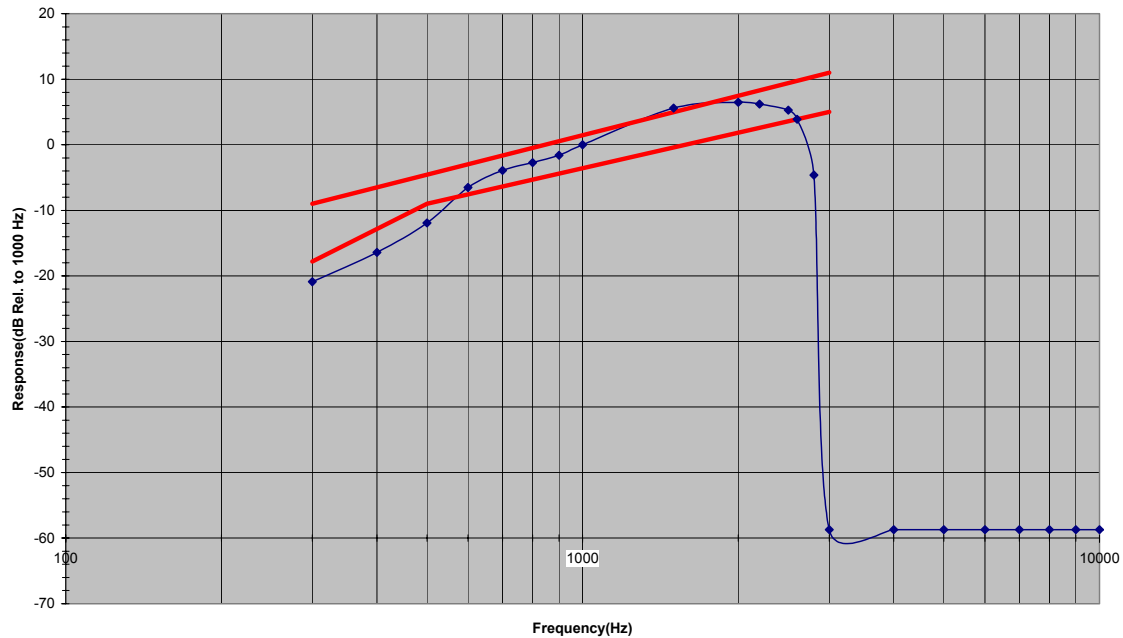
Section 4.1 Audio Frequency Response

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

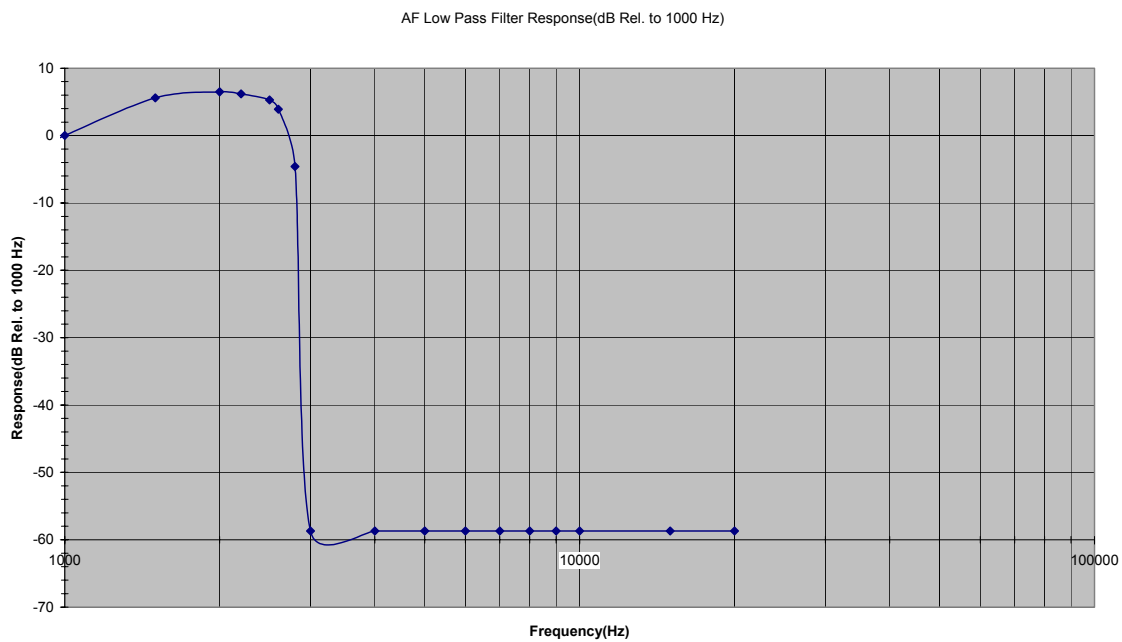
Section 4.2 Audio Low-Pass Filter Response

NAME OF TEST: Audio Low-Pass Filter Response

PARA. NO.: 2.987(a)

TESTED BY: Kevin Rose

DATE: 7 DEC. 2004



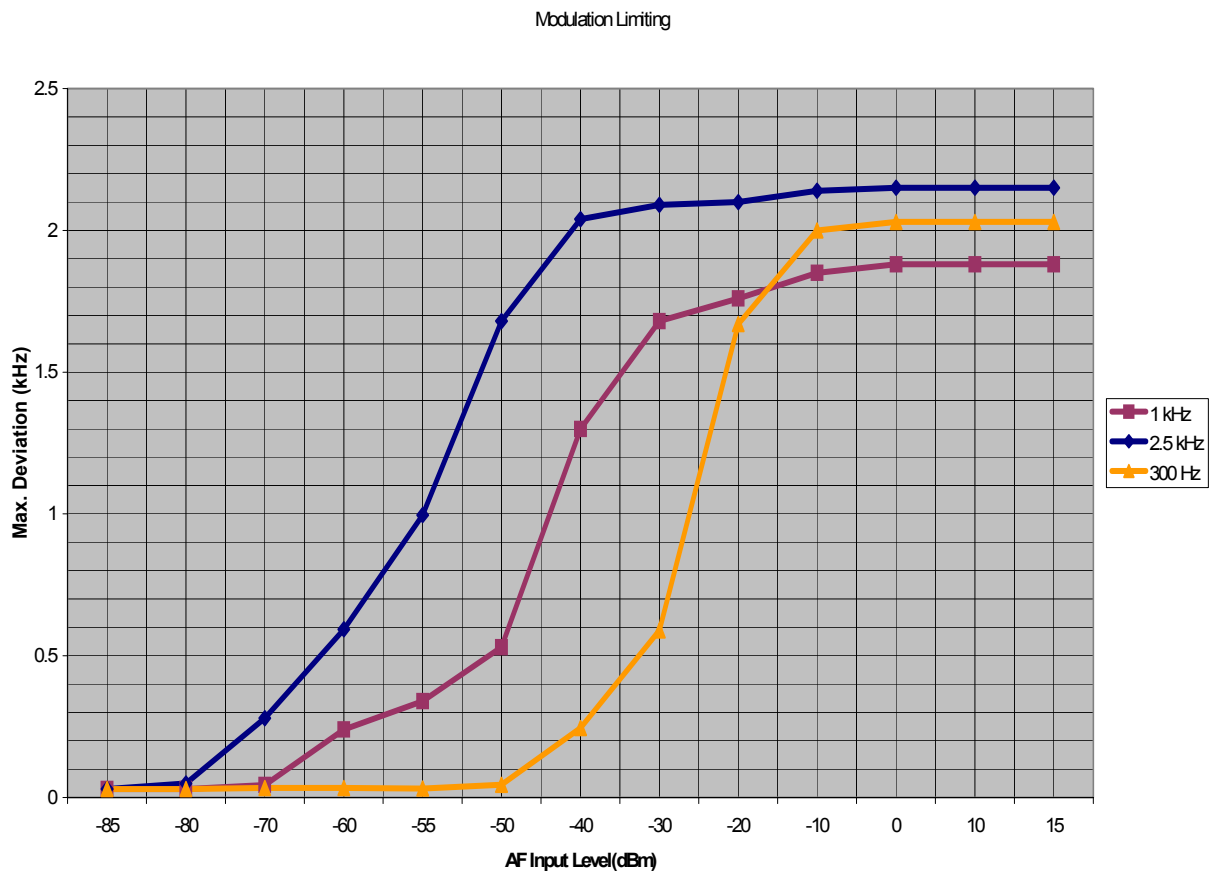
Section 4.3 Modulation Limiting

NAME OF TEST: Modulation Limiting

PARA. NO.: 2.987(b)

TESTED BY: Kevin Rose

DATE: 7 DEC. 2004



Maximum deviation for non-voice modulation __+/-3__ kHz.

EQUIPMENT: 431x VHF Transceiver

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Section 5. Occupied Bandwidth

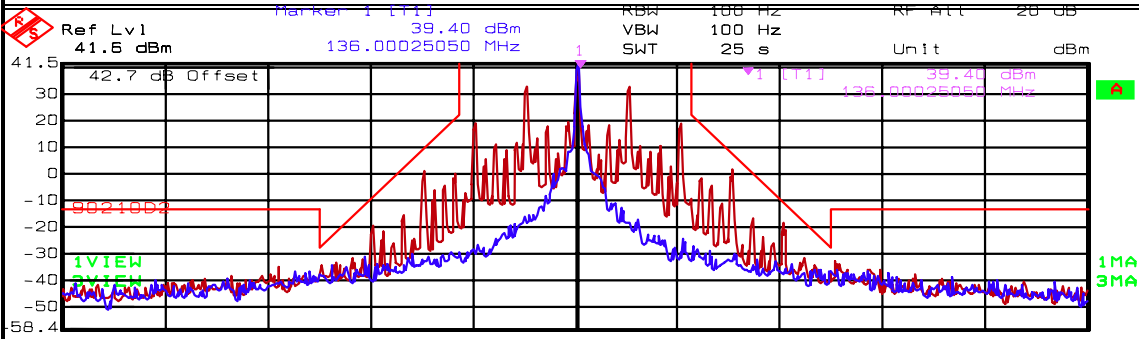
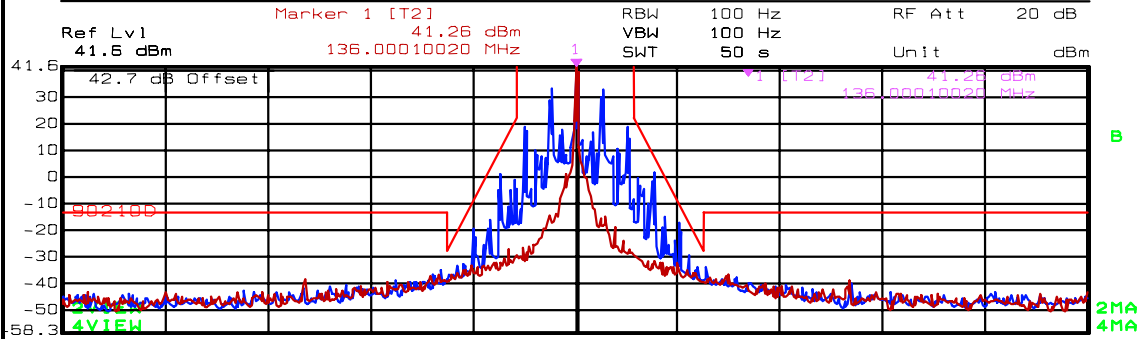
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: Kevin Rose	DATE: 9 DEC. 2004

Measurement Results: Complies.

Measurement Data: See attached data

EQUIPMENT: 431x VHF Transceiver

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Nemko Dallas, Inc.			
Data		Occupied	
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
Test Equipment Used			
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			
Notes: 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



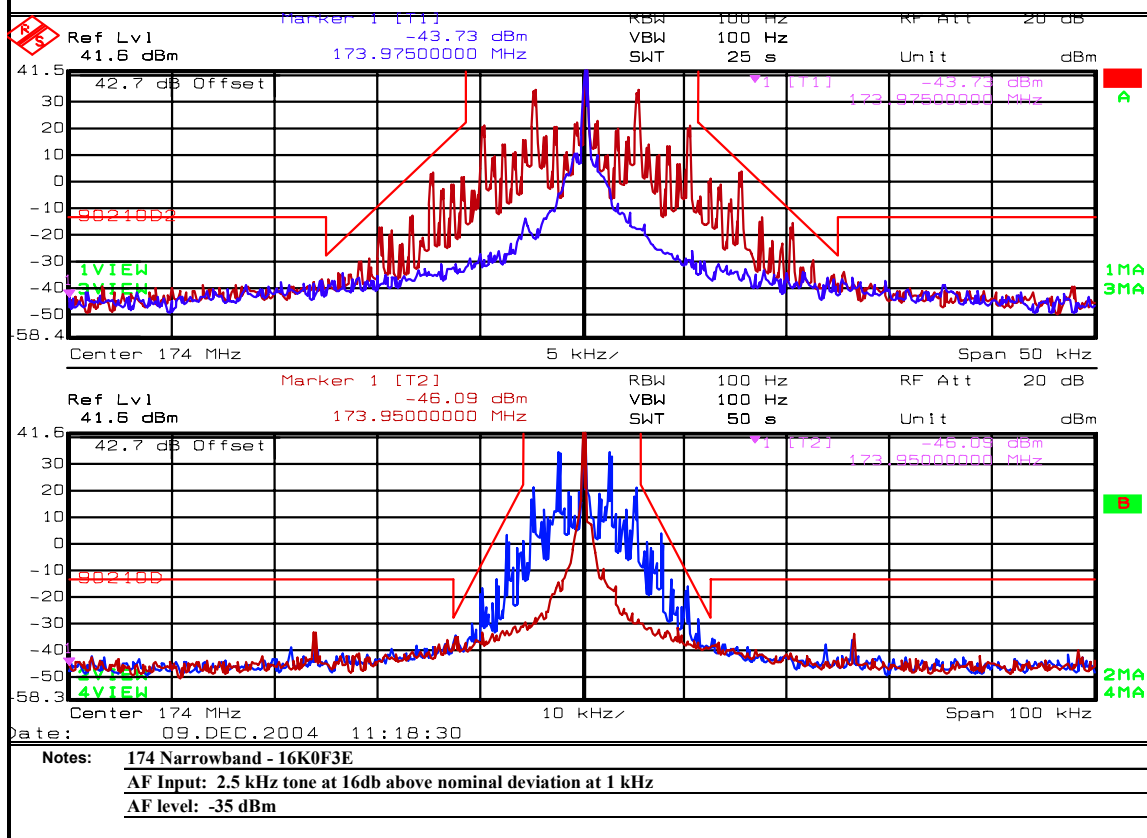
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Job No.: 4L0696 Date: 12/9/2004
Specification: Part 90/RSS 119 Temperature(°C): 21
Tested By: Kevin Rose Relative Humidity(%) 33
E.U.T.: 431xx vhf analog radio
Configuration:



EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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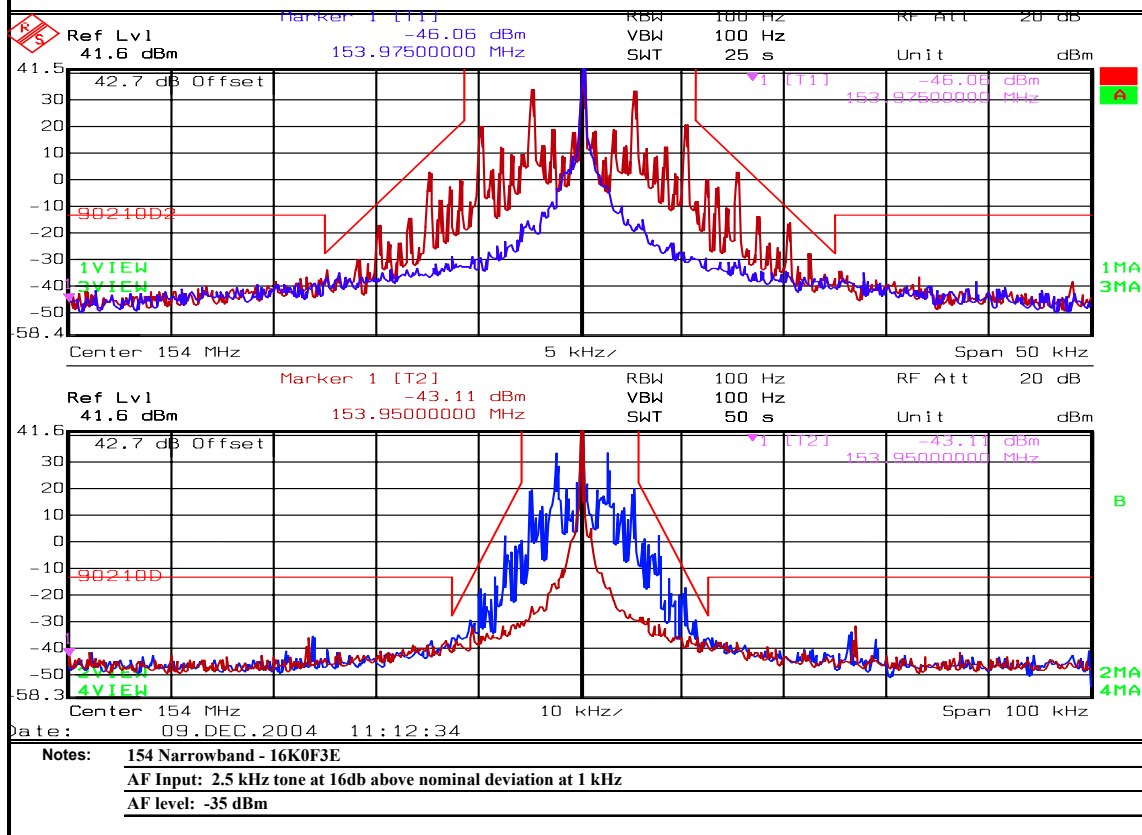
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Data Plot

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



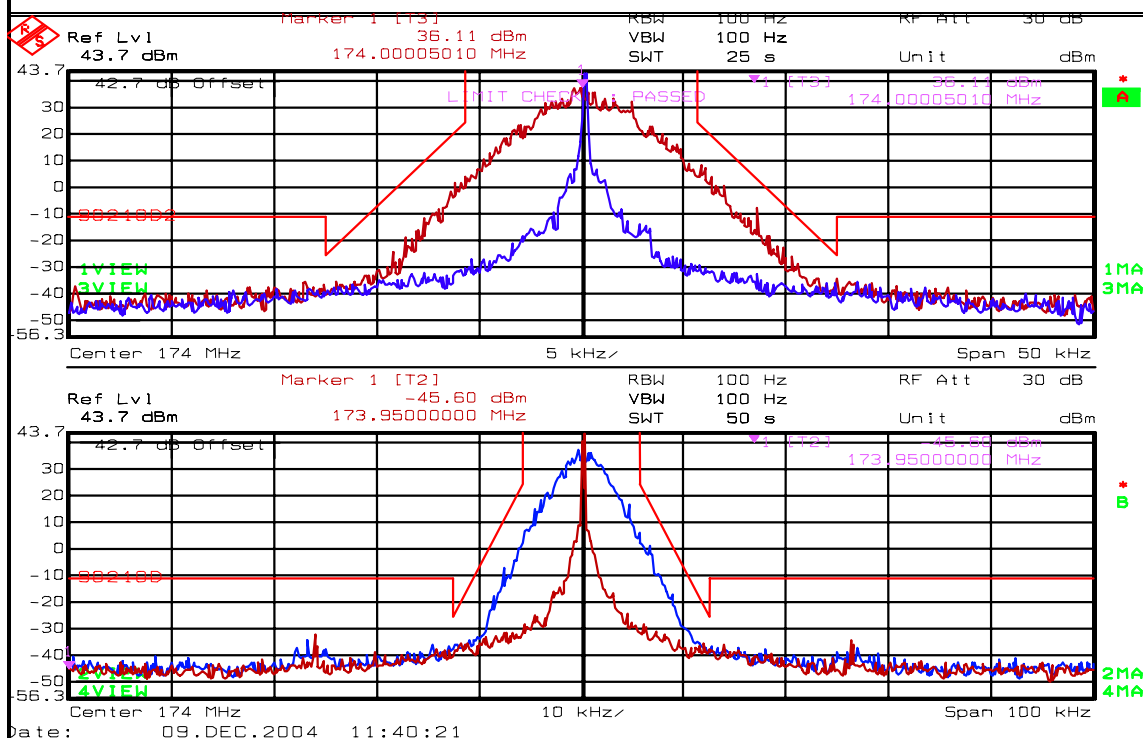
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Page 4, of 6

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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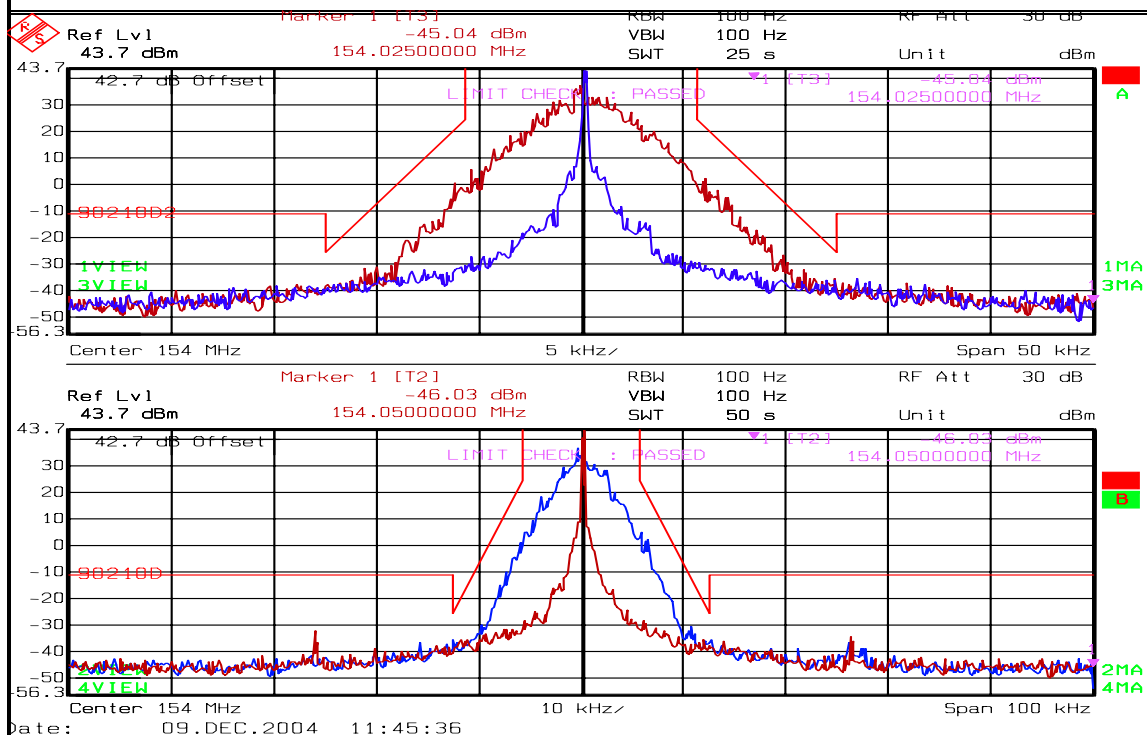
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Data Plot

Occupied Bandwidth

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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:



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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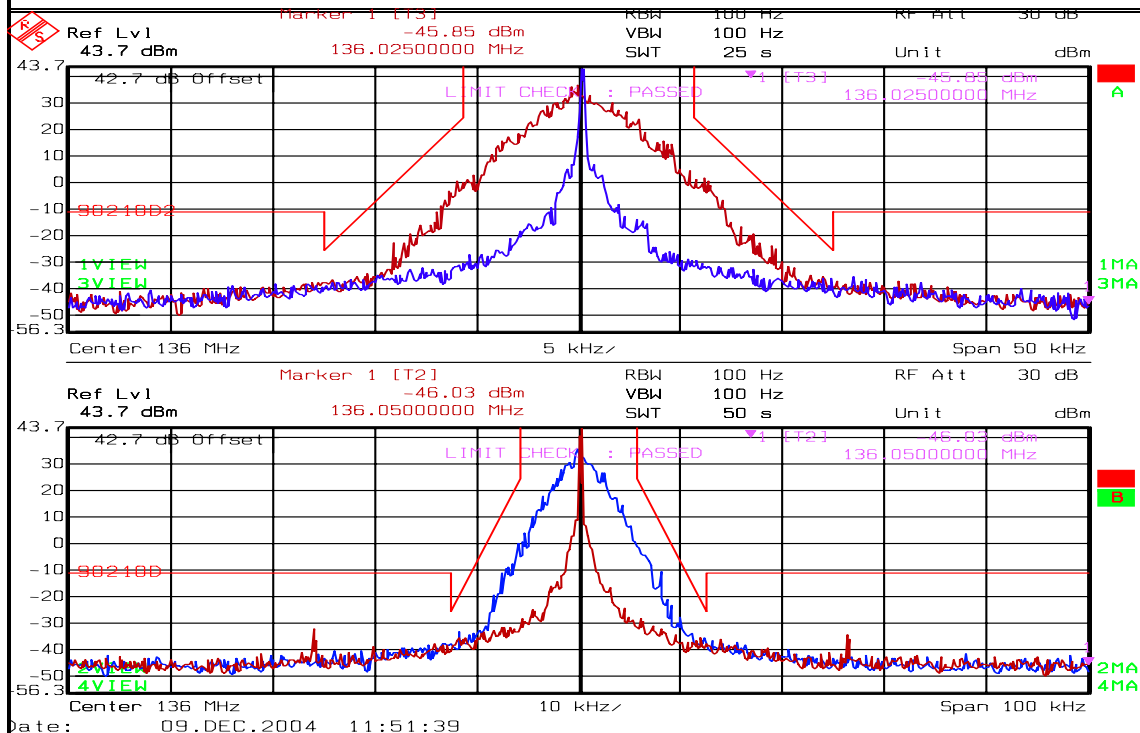
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Data Plot

Occupied Bandwidth

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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:



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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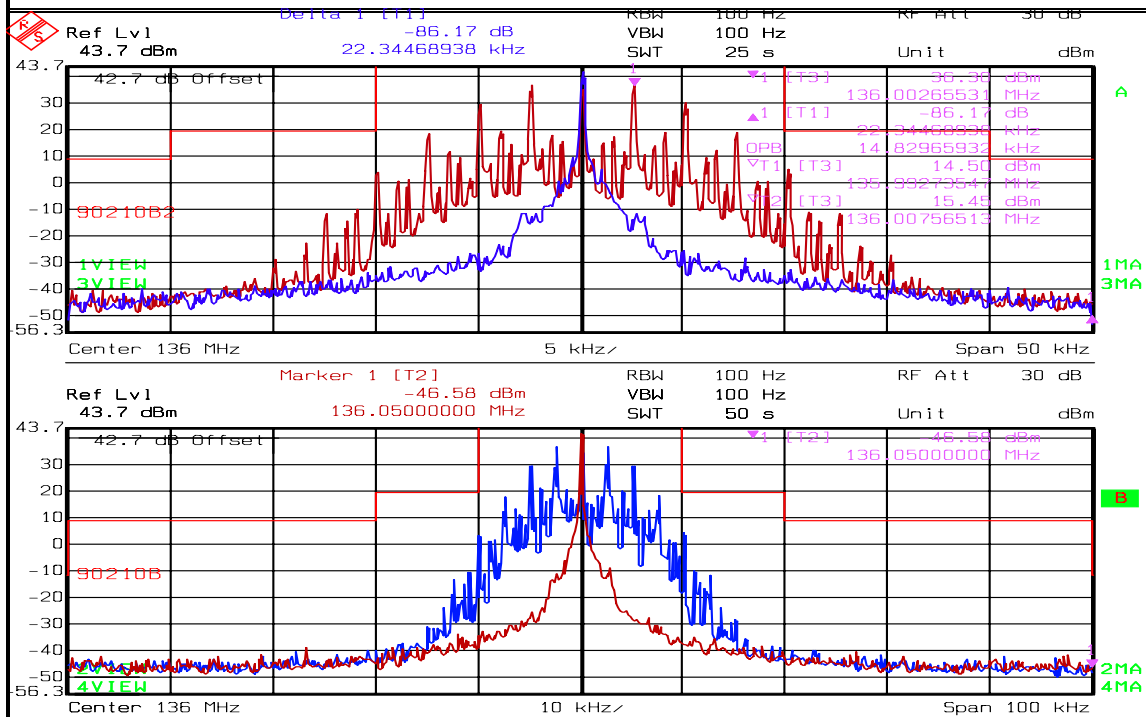
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Data Plot

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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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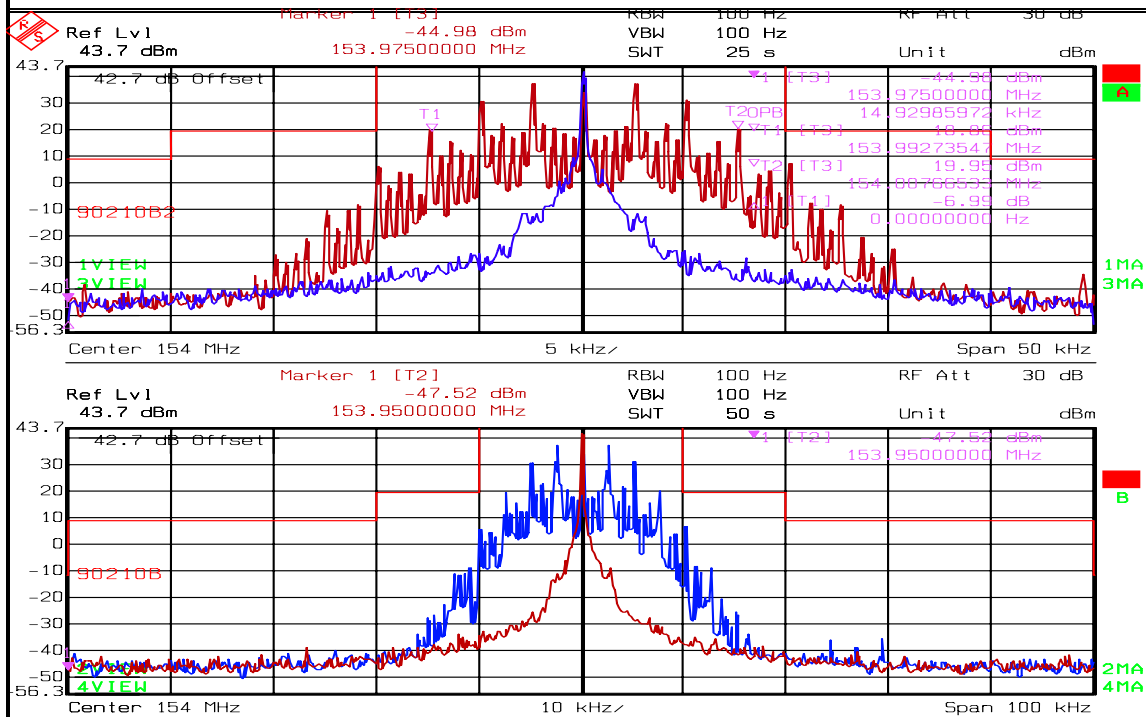
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Data Plot

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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 13:15:19

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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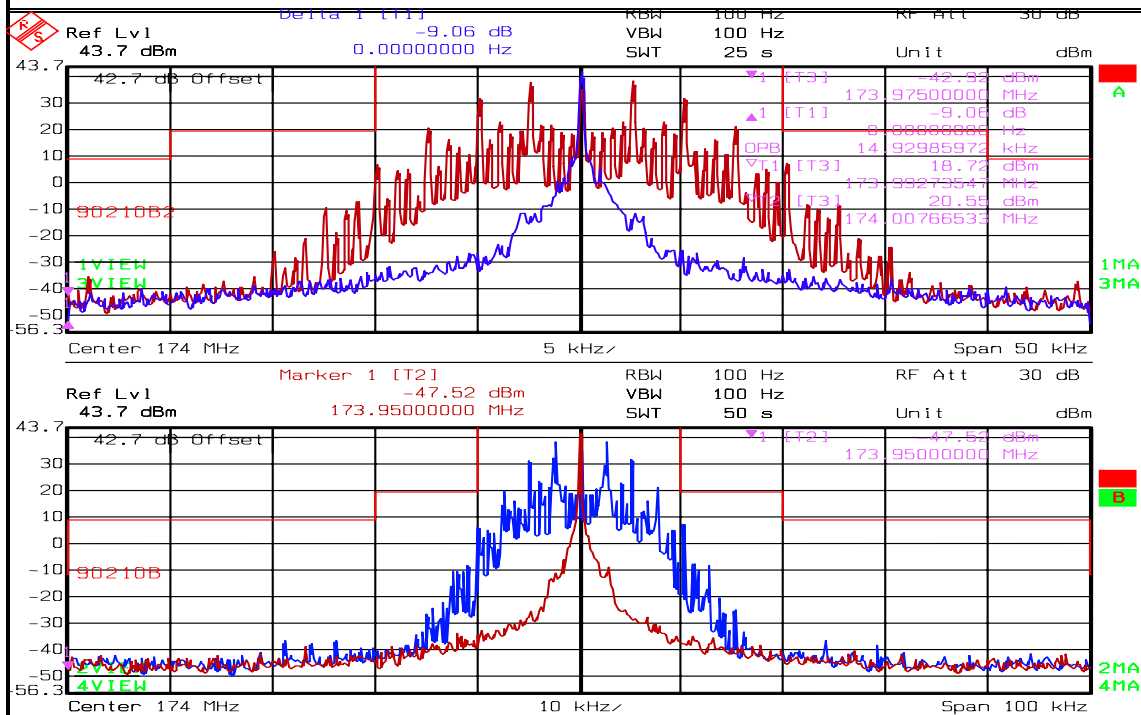
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Data Plot

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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

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Nemko Dallas, Inc.			
Data Plot		Occupied Bandwidth	
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	
Test Equipment Used			
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 43.3 dBm Marker 1 [11] -42.07 dBm 136.02500000 MHz RBW 100 Hz VBW 100 Hz SWT 25 s RF Att 30 dB Unit dBm 43.3 40 30 20 10 0 -10 -20 -30 -40 -50 56.7 39.6 dB Offset 1VIEW 2VIEW 902100 Center 136 MHz 5 kHz Span 50 kHz * A 1MA 2MA			
Date: 19.JAN.2005 10:03:16			
Notes: 8K0F1E/8K0F1D - Mask D			
AF Input: -7 dBm			

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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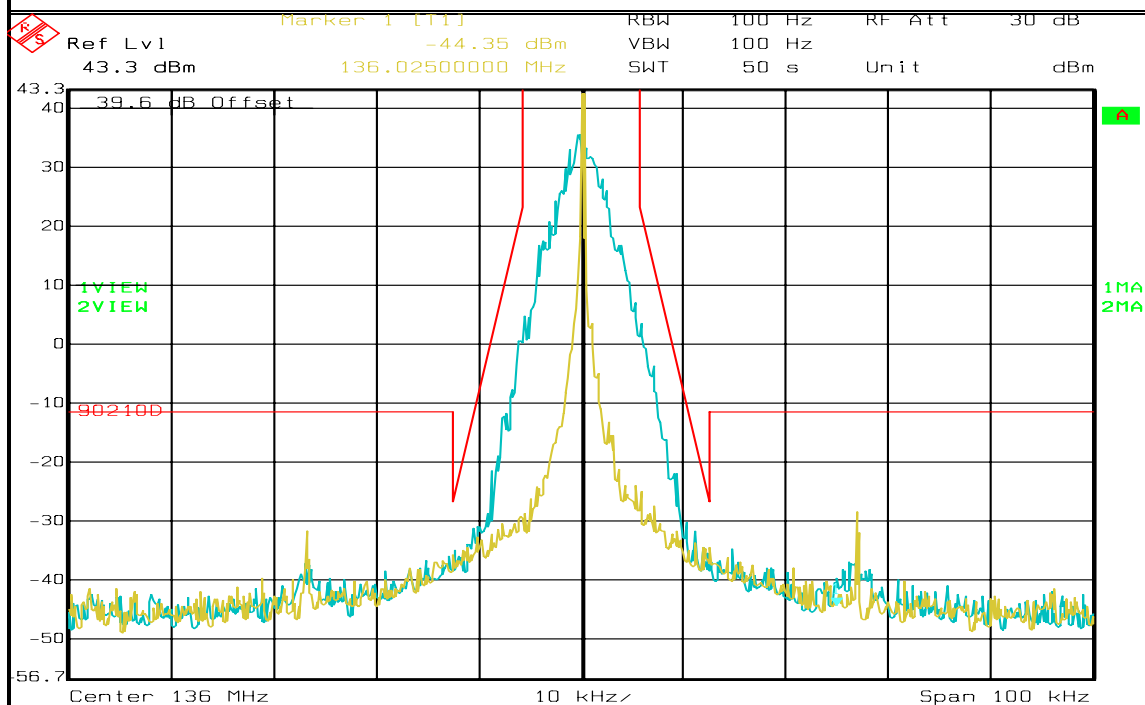
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Data Plot

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



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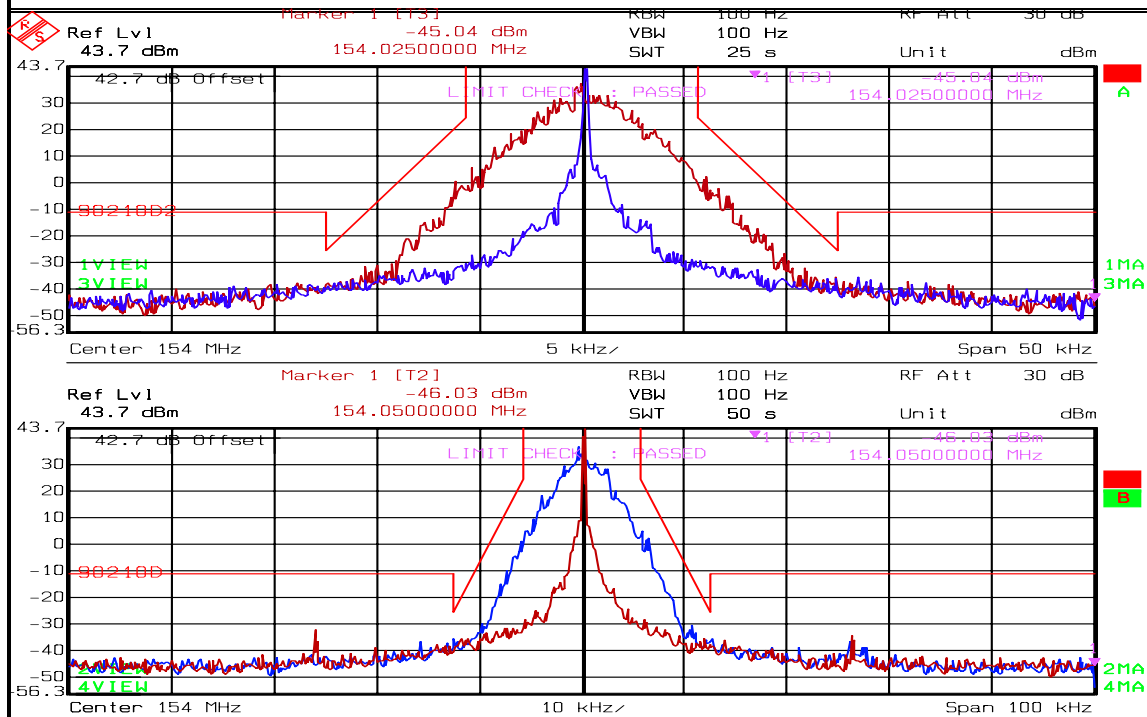
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Data Plot

Occupied Bandwidth

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:



Date: 09.DEC.2004 11:45:36

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

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1



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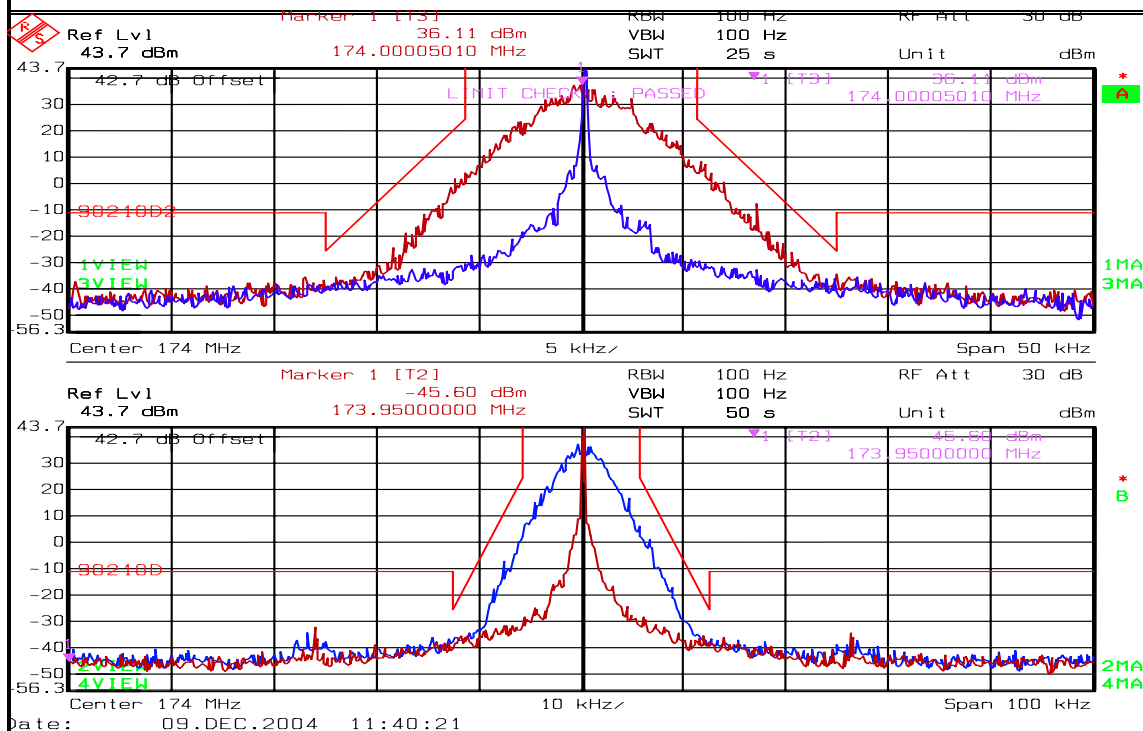
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Data Plot

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:



Notes: 174 digital

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

Section 6. Spurious Emissions at Antenna Terminals

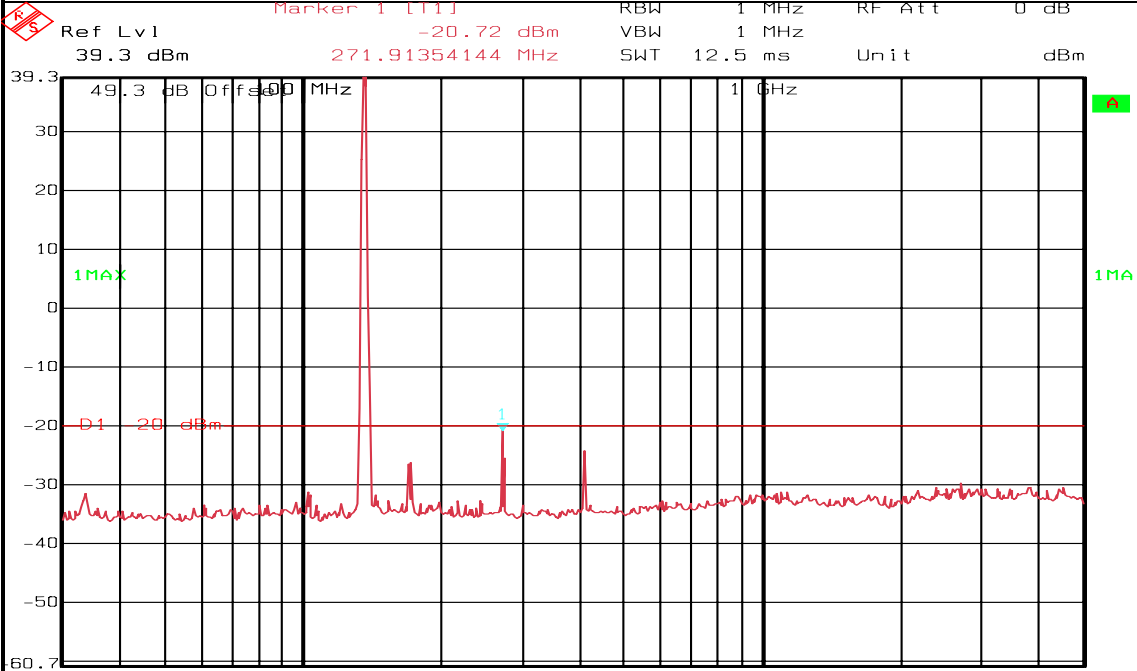
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: Kevin Rose	DATE: 24 Nov. 2004

Measurement Results: Complies.

Measurement Data: See attached data

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

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Nemko Dallas, Inc.			
Data Plot		Spurious Emissions at Antenna Terminals	
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		
Test Equipment Used			
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			
			
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:

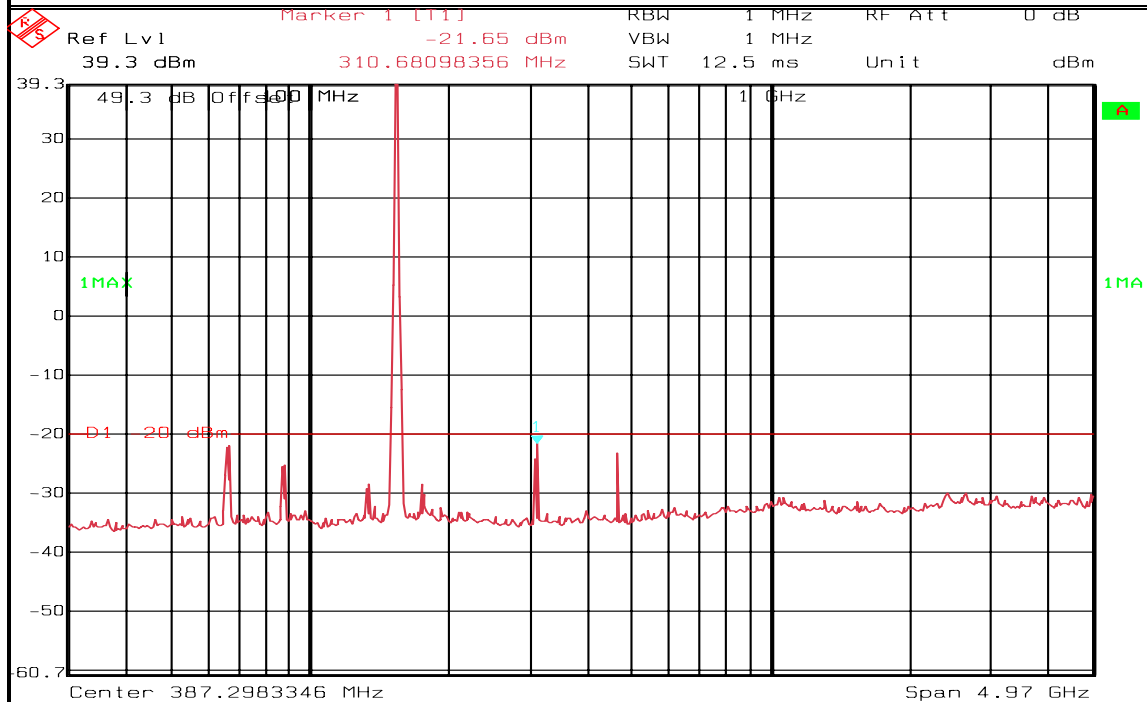
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Data Plot

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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



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



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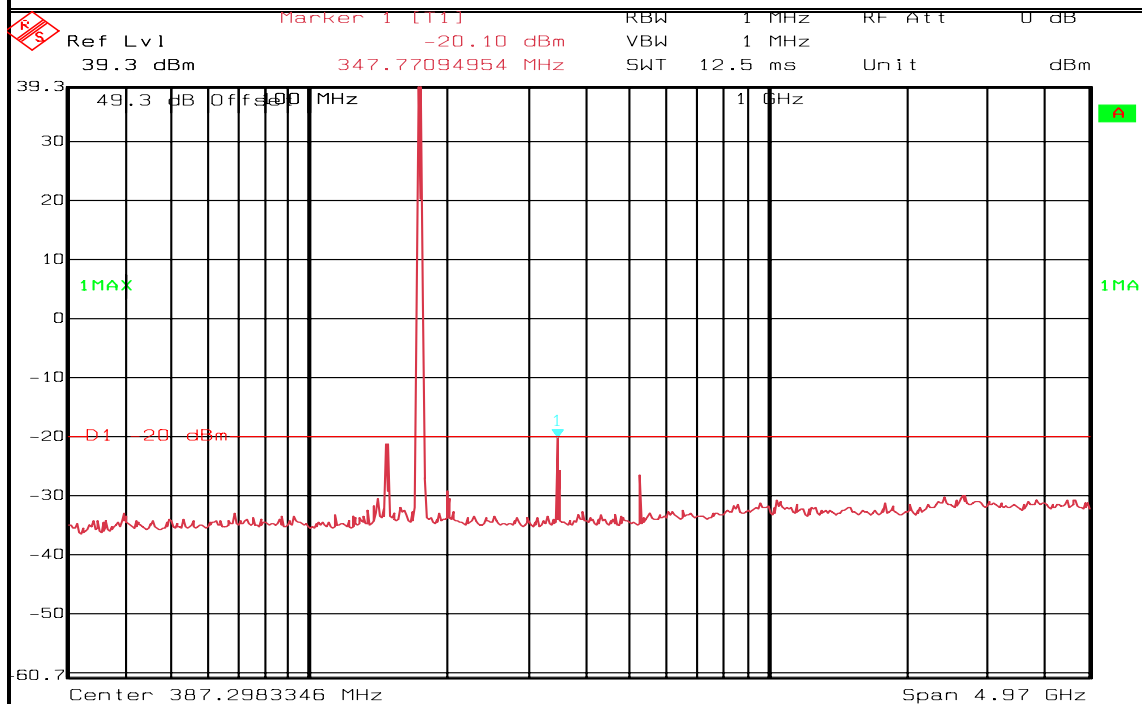
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Data Plot

Spurious Emissions at Antenna Terminals

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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:



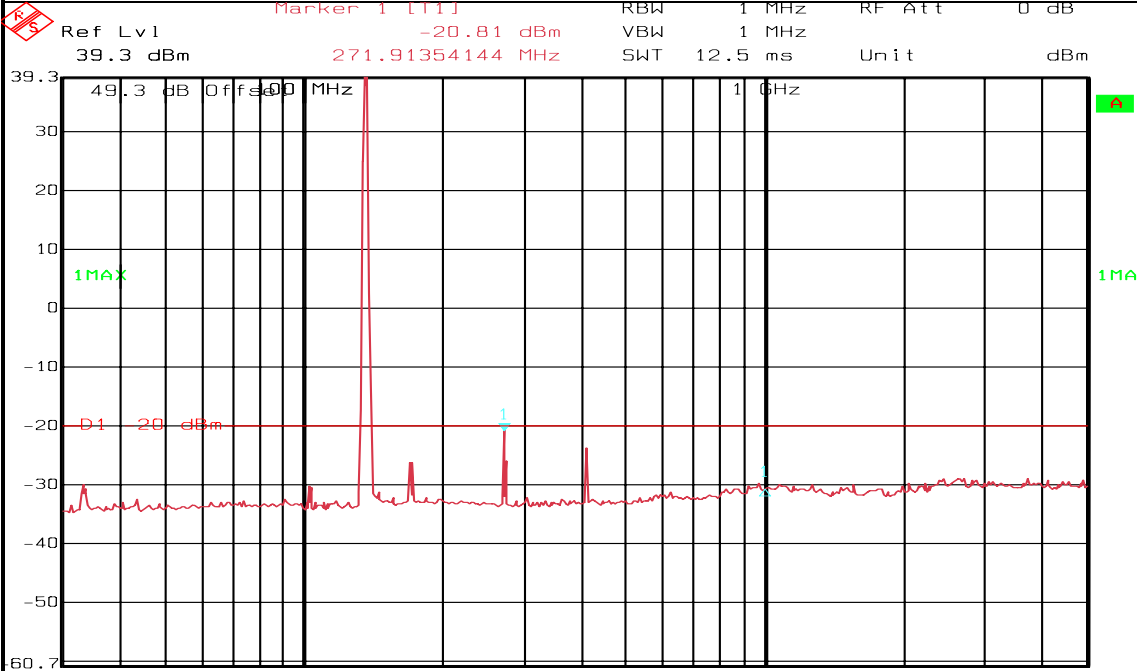
Date: 12.JAN.2005 16:22:34

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

AF Input: -7 dBm

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667	
		Nemko Dallas, Inc.	
Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 2	Job No.: 4L0696	Date: 1/12/2005	Complete ☒ X
Specification: Part 90/RSS 119	Temperature(°C): 23	Preliminary: ☐	
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		
Test Equipment Used			
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 [1] -20.81 dBm RBW 1 MHz RF Att 0 dB Unit dBm			
39.3 dB Offset 0 MHz 271.91354144 MHz VBW 1 MHz SWT 12.5 ms Unit dBm			
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



Nemko Dallas, Inc.

Dallas Headquarters:

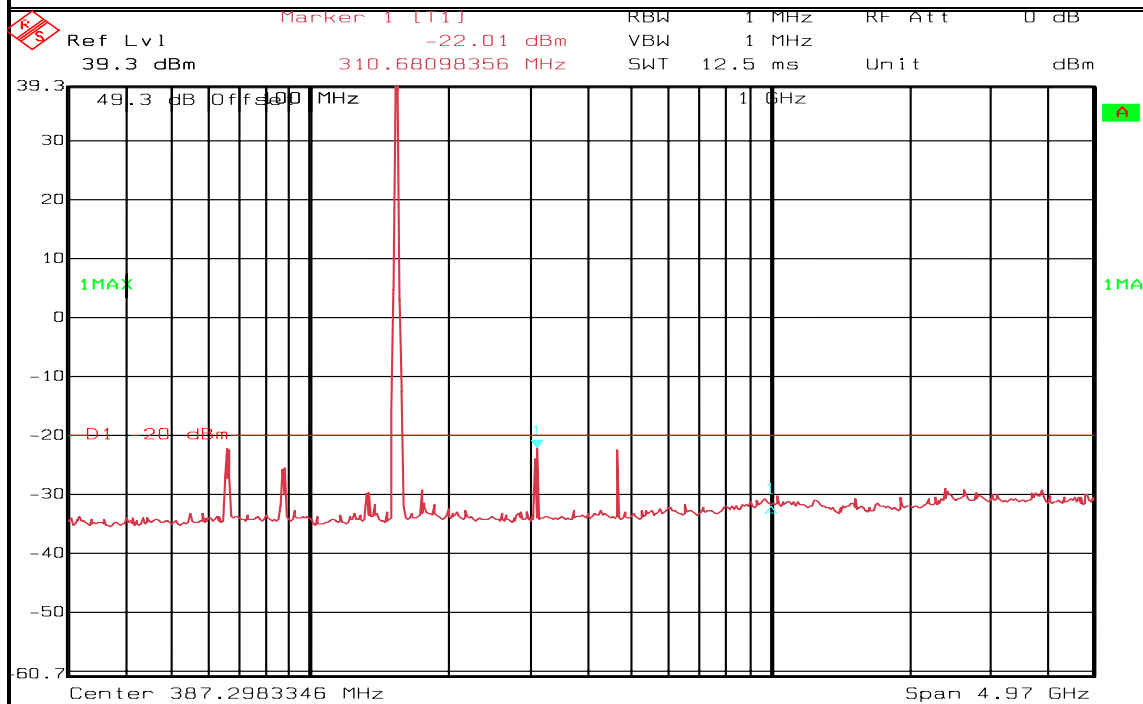
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

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



Date: 12.JAN.2005 16:12:18

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



Nemko Dallas, Inc.

Dallas Headquarters:

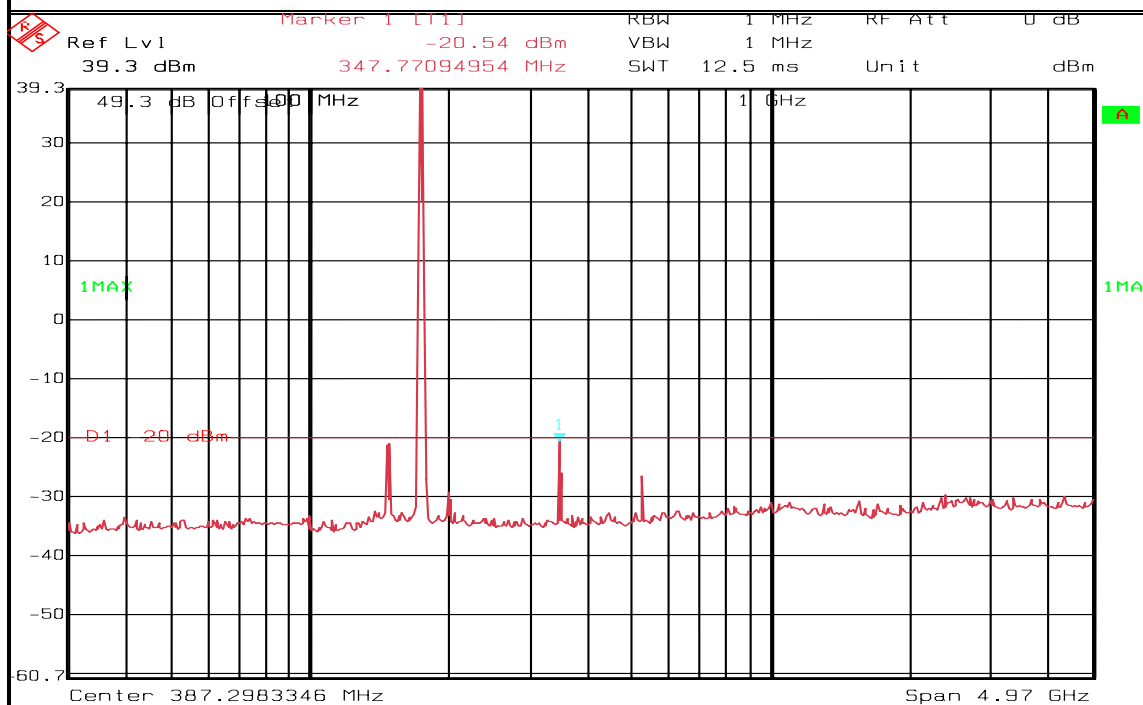
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Data Plot

Spurious Emissions at Antenna Terminals

Page 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



Nemko Dallas, Inc.

Dallas Headquarters:

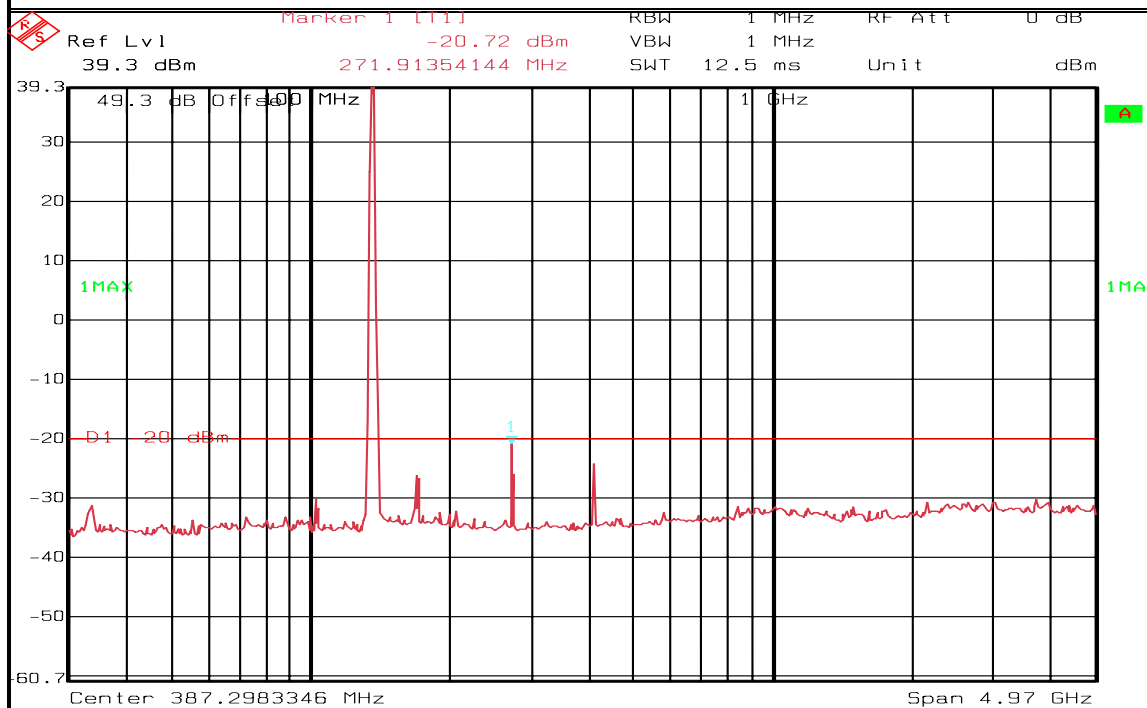
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Data Plot

Spurious Emissions at Antenna Terminals

Page 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:

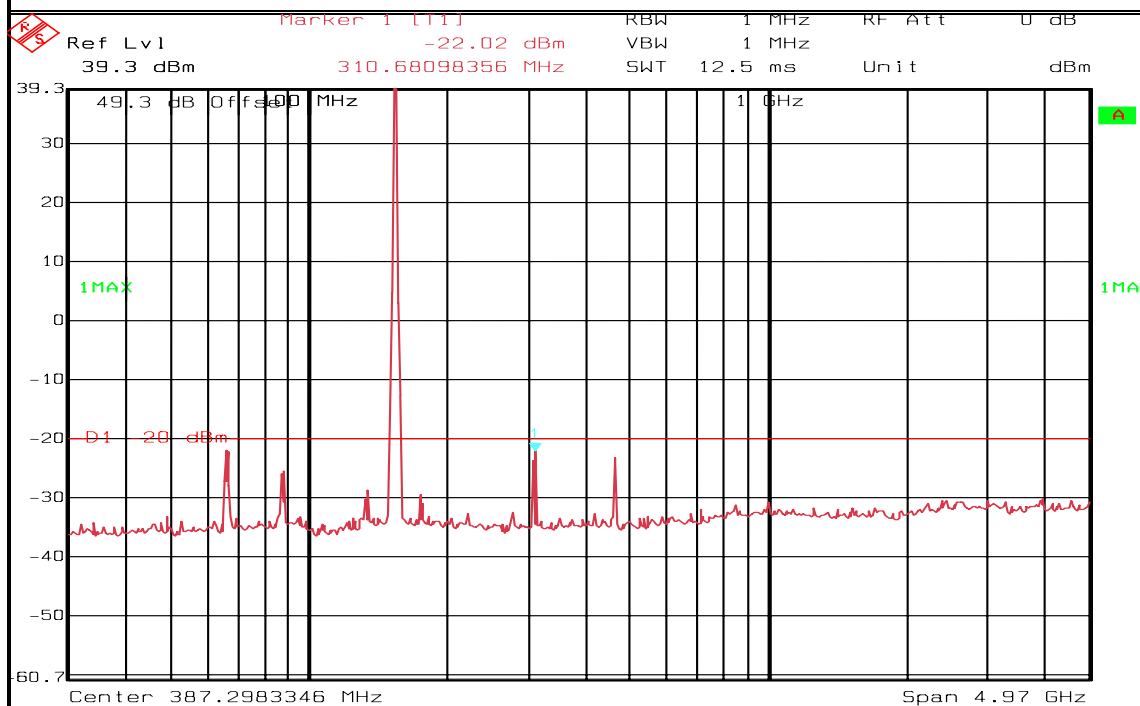
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

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:

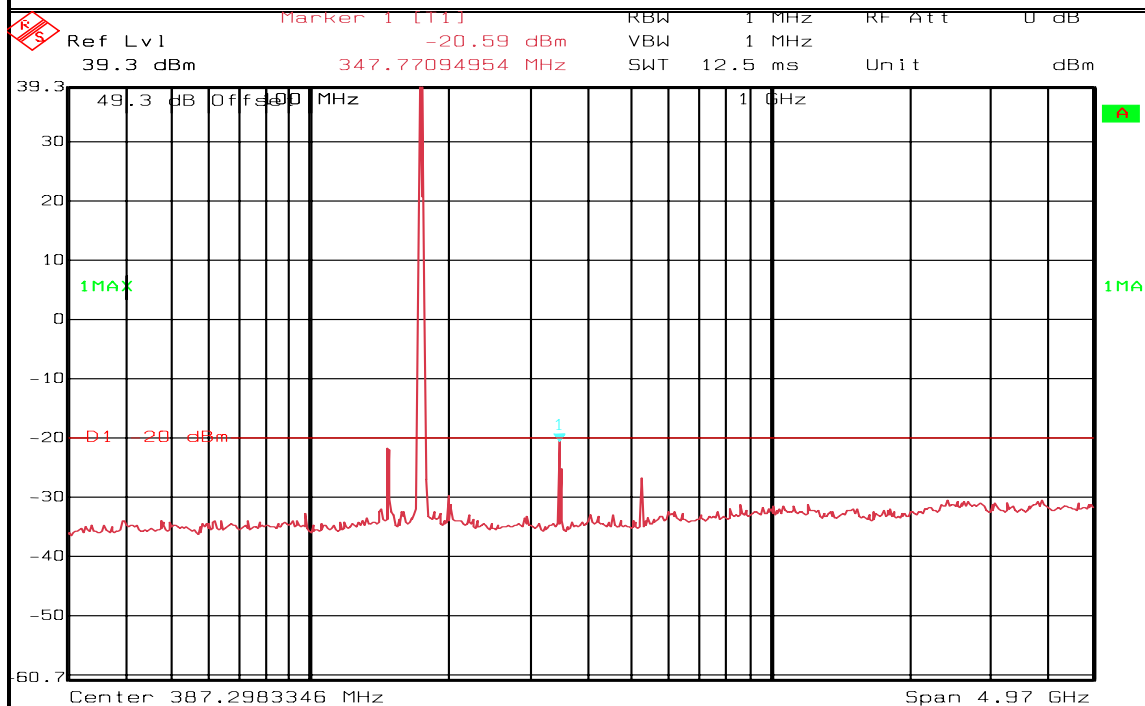
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

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

EQUIPMENT: **431x VHF Transceiver**

PROJECT NO.: **4L0696RUS1**

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

		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667					
Nemko Dallas, Inc.							
<u>Frequency Stability</u>							
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>							
<u>Test Equipment Used</u>							
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>1x10⁻⁷ 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**

Section 9. Transient Frequency Behavior

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

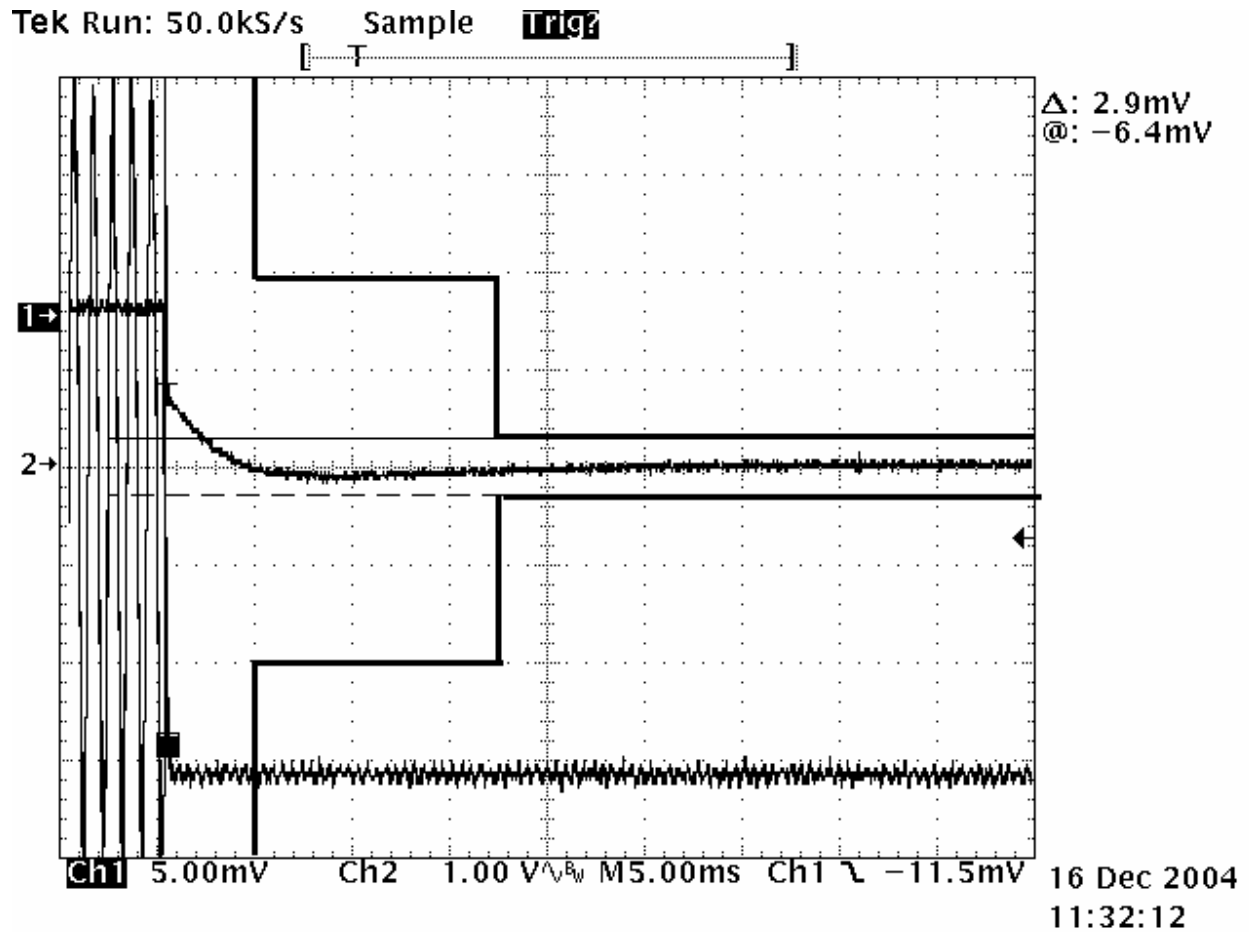
Measurement Results: Complies.

Measurement Data: See attached data

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

EQUIPMENT: 431x VHF Transceiver

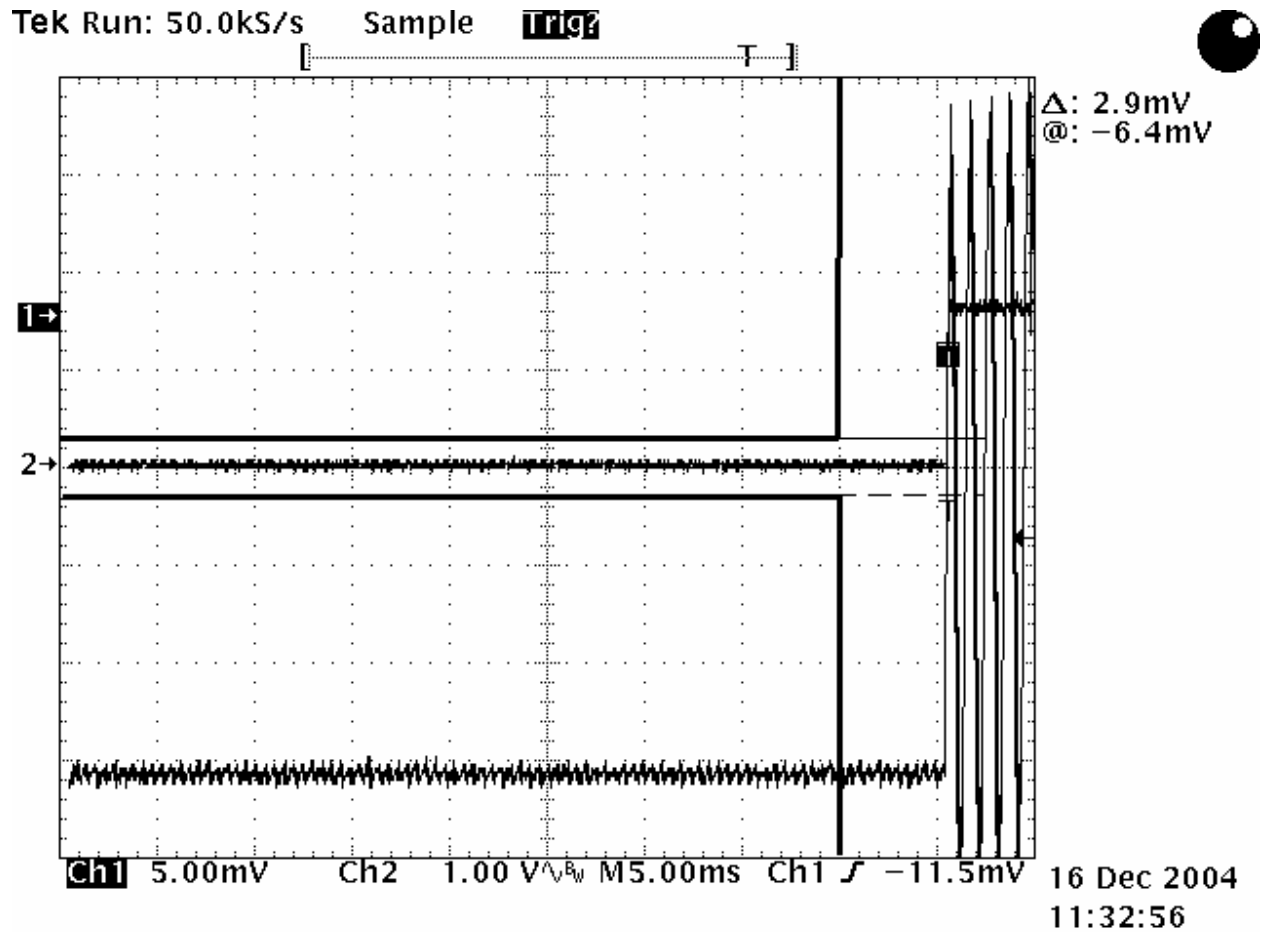
PROJECT NO.: 4L0696RUS1



Switch on Condition – 12.5 kHz Channel Spacing

EQUIPMENT: 431x VHF Transceiver

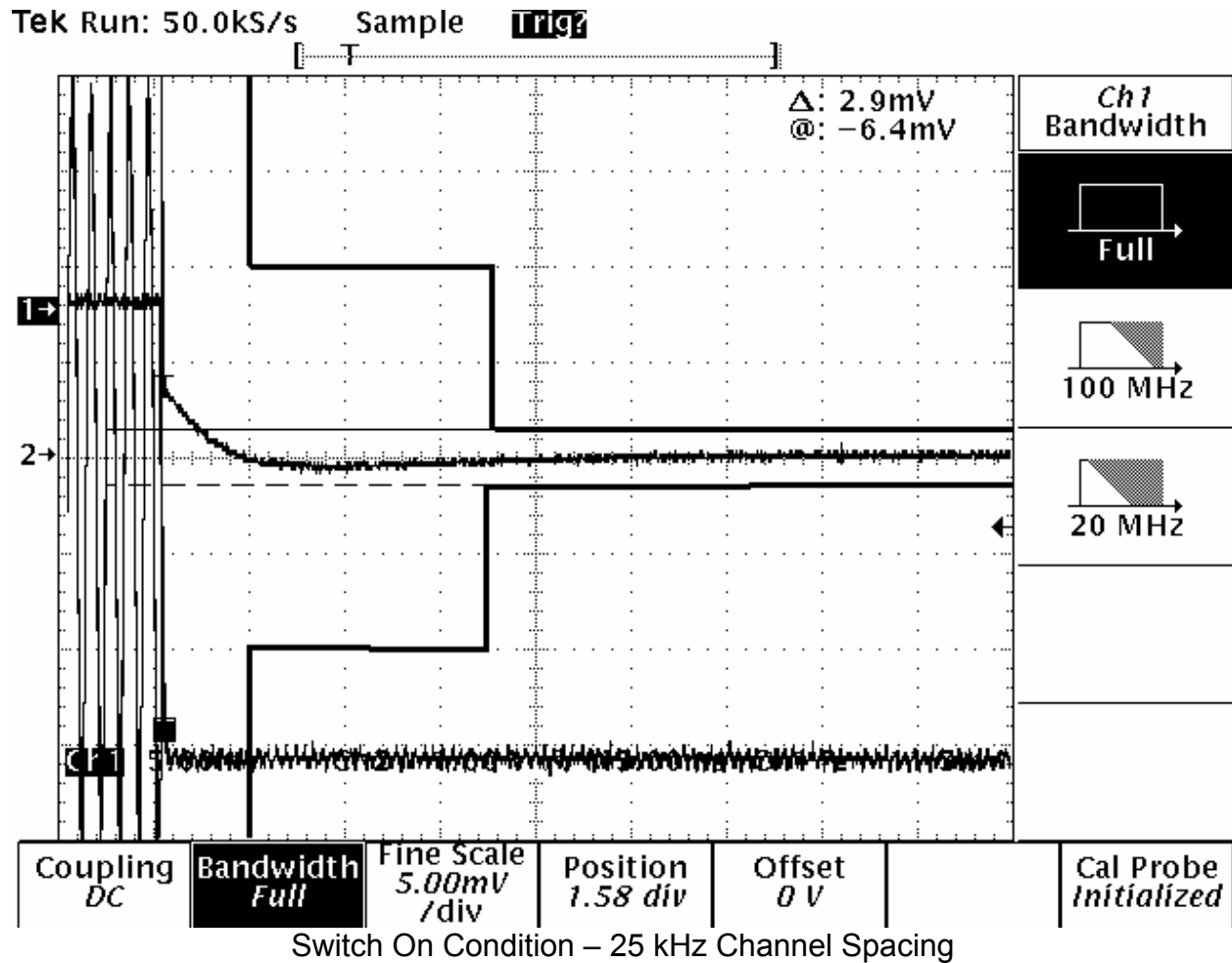
PROJECT NO.: 4L0696RUS1



Switch off Condition – 12.5 kHz Channel Spacing

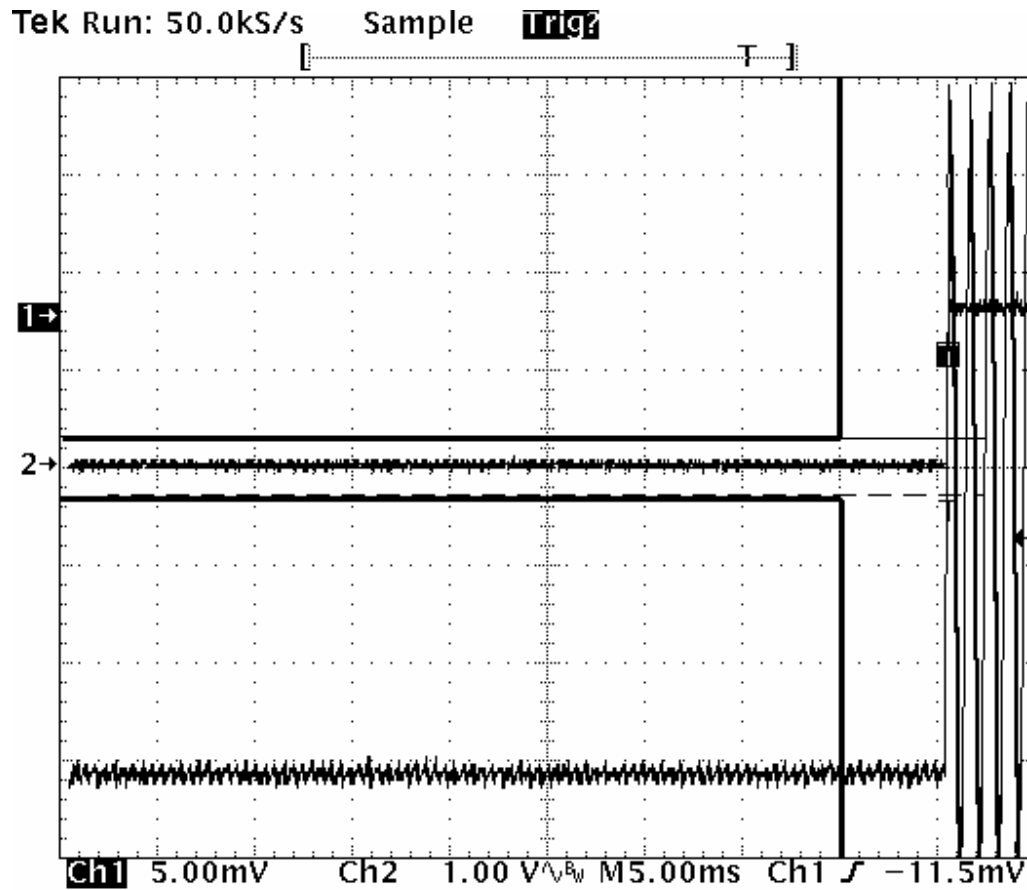
EQUIPMENT: 431x VHF Transceiver

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

ANNEX A - TEST METHODOLOGIES

EQUIPMENT: 431x VHF Transceiver

PROJECT NO.: 4L0696RUS1

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

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

Method Of Measurement:

Detachable Antenna:

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

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

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: ⇒ RBW

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

EQUIPMENT: 431x VHF TransceiverPROJECT NO.: 4L0696RUS1

NAME OF TEST: Field Strength of Spurious**PARA. NO.: 2.993****Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.

Test Method: The 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**

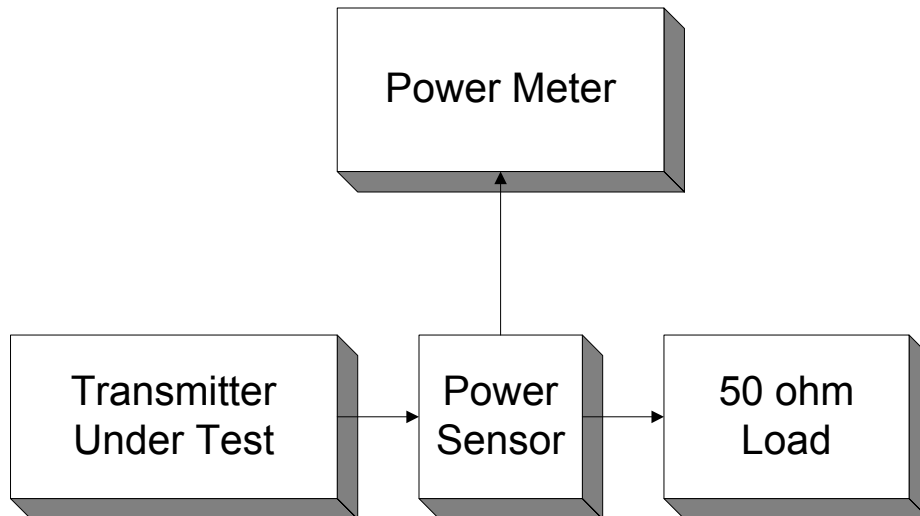
	Maximum	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
Time intervals ^{1,2}	Frequency difference ³ (kHz)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	± 25	5.0	10.0	20.0	5.0	10.0	5.0
t ₂	± 12	20.0	25.0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

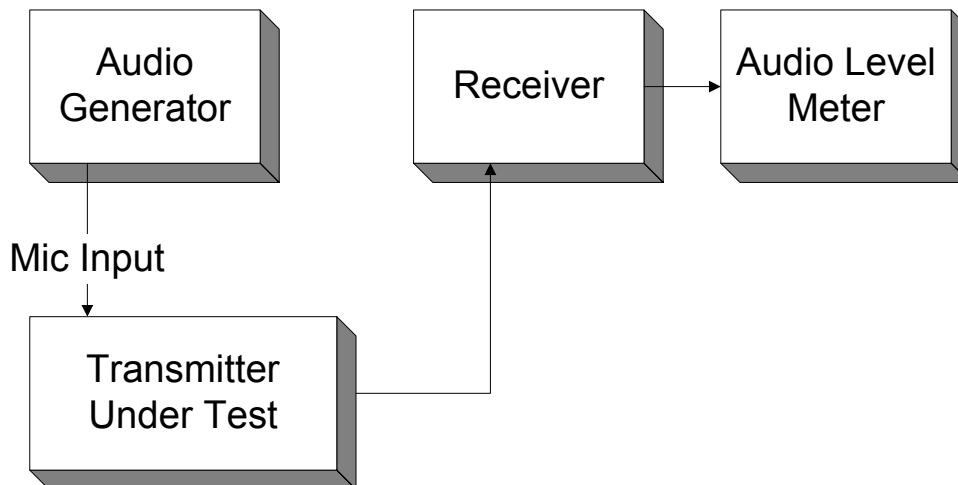
	Maximum	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
Time intervals ^{1,2}	Frequency difference ³ (kHz)			
t ₁ ⁴	± 12.5 / ± 6.25	5.0	10.0	20.0
t ₂	± 6.25 / ± 3.125	20.0	25.0	50.0
t ₃ ⁴	± 12.5 / ± 6.25	5.0	10.0	10.0

ANNEX B - TEST DIAGRAMS

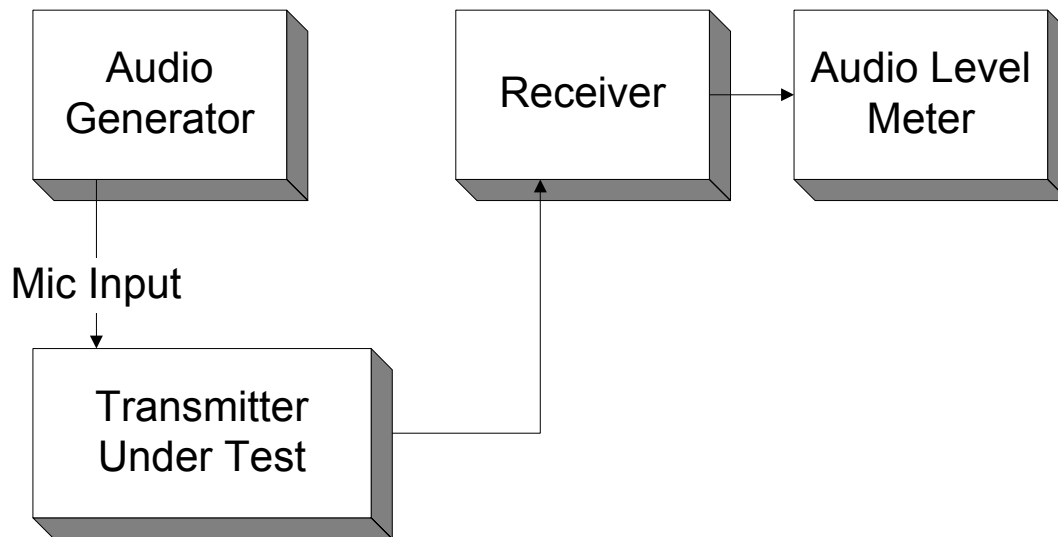
Para. No. 2.985 - R.F. Power Output



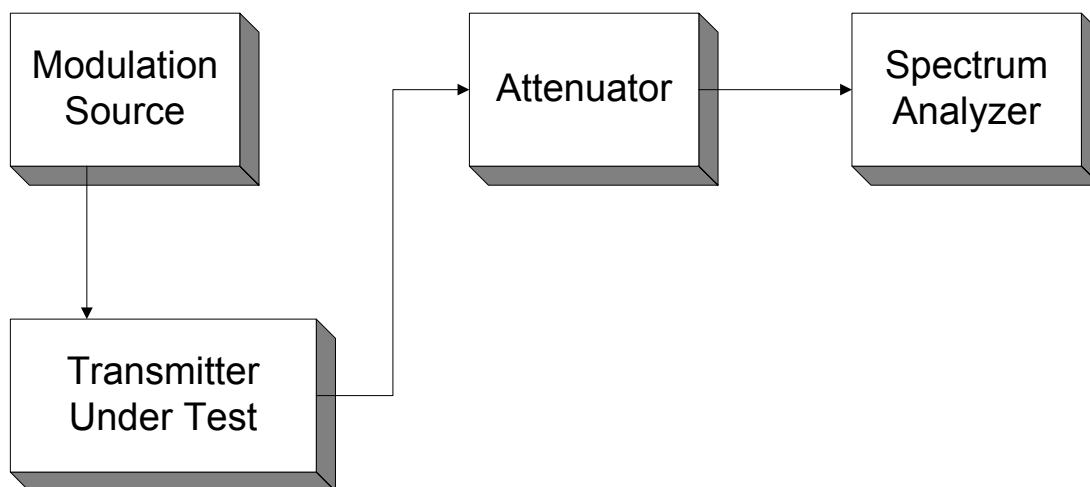
Para. No. 2.987(a) - Audio Frequency Response



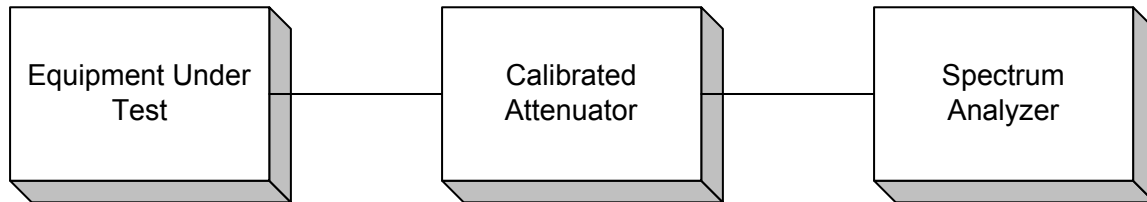
Para. No. 2.987(b) - Modulation Limiting



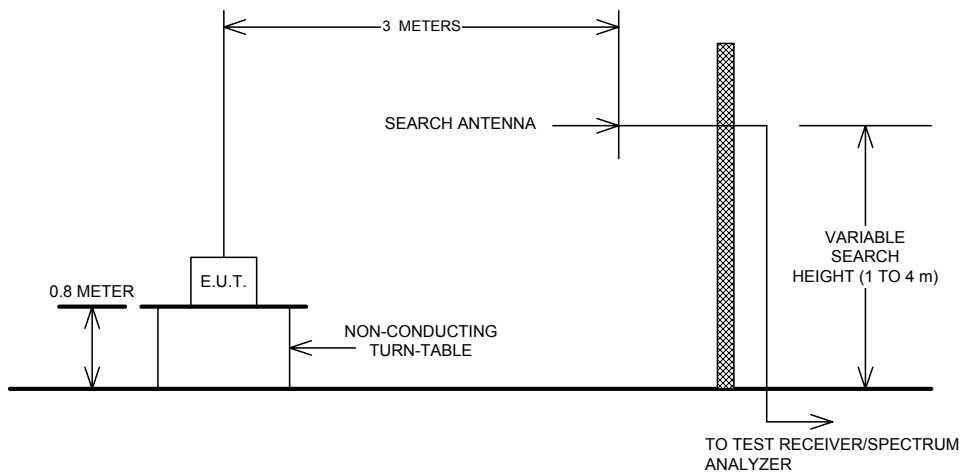
Para. No. 2.989 - Occupied Bandwidth



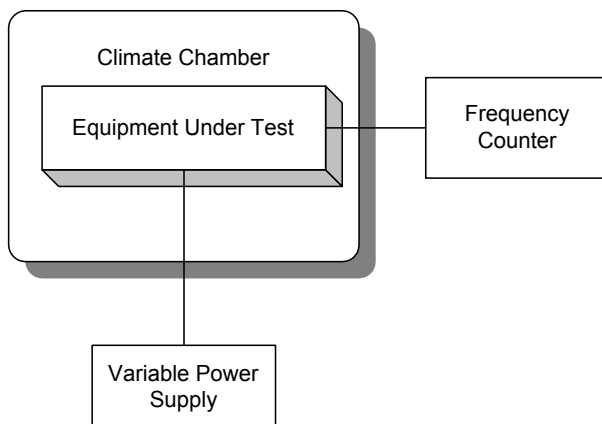
Para. No. 2.991 - Spurious Emissions at Antenna Terminals

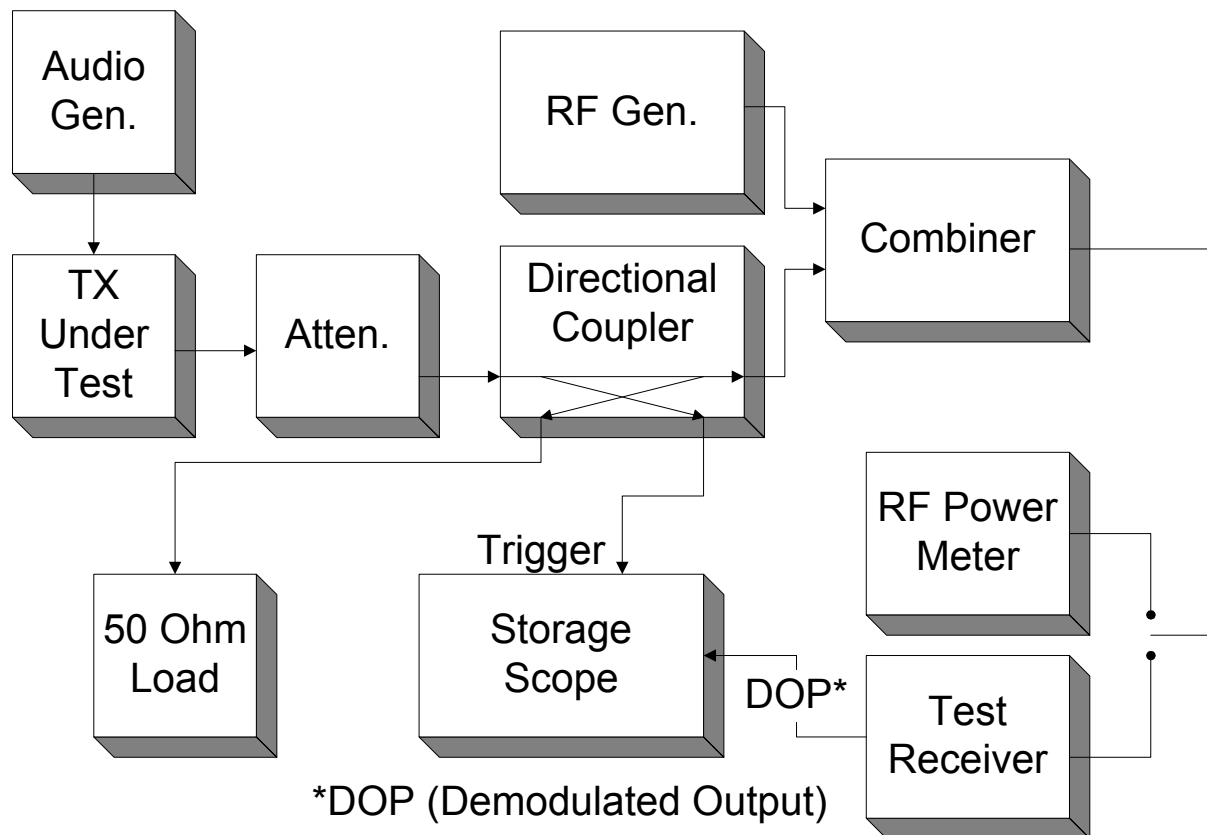


Para. No. 2.993 - Field Strength of Spurious Radiation



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).