

Nemko Test Report: 1L0388RUS2

Applicant: Allen Telecom
140 Vista Center Drive
Forest, VA 24551

Equipment Under Test: Repeater MR303 Varia
(E.U.T.)

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

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

Authorized By:



Tom Tidwell, Wireless Group Manager

Date: 10/18/01

Total Number of Pages: 60

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EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2

Section 1. Summary of Test Results

Manufacturer: Allen Telecom

Model No.: 149110

Serial No.: 1576

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, Subpart I.



New Submission



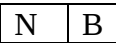
Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".

**NVLAP LAB CODE: 100426-0**

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EQUIPMENT: MR303 Varia**PROJECT NO.: 1L0388RUS2**

Summary Of Test Data

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

Footnotes For N/A's:

- (1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
 - (2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.
 - (3) Since the E.U.T. is a repeater there was no need for frequency stability.
- .

Section 2. General Equipment Specification**Transmitter**

Supply Voltage Input: 115 Vac

Frequency Range:	Uplink	896-901 MHz
	Downlink	935-940 MHz

Tunable Bands: Complete coverage

Type(s) of Modulation:	2FSK	4FSK	F2D (Voice)	D7W (QAM)	Other
	☒	☒	☒	☒	☐

Gain: 58 dB

Maximum Input: +10 dBm without damage

Output Impedance: 50 ohms

RF Power Output (rated):	Uplink	+24 dBm
	Downlink	+8 dBm

Channel Spacing(s): 12.5 kHz

Operator Selection of Operating Frequency: Complete band coverage

Power Output Adjustment Capability: Manual

Frequency Translation:	F1-F1	F1-F2	N/A
	☒	☐	☐

Band Selection:	Software	Duplexer Change	Fullband Coverage
	☐	☐	☒

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

Description of Modifications For Class II Permissive Change

Not Applicable

Modifications Made During Testing

Not Applicable

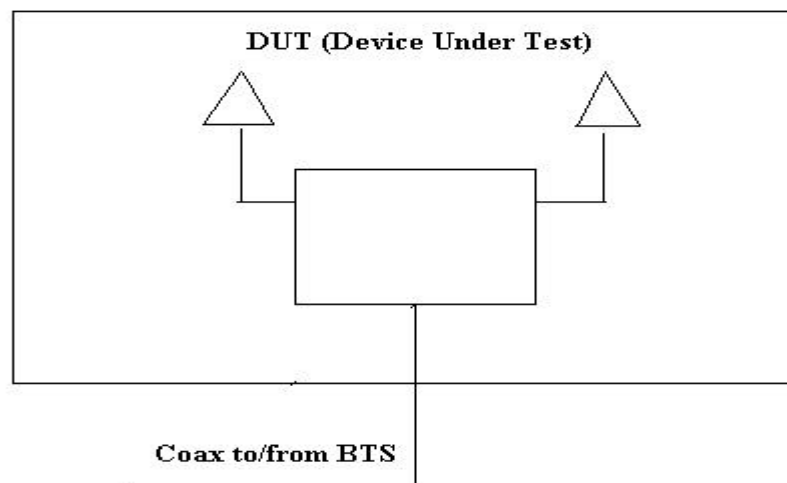
Theory of Operation

The repeater MR303 Varia is a bi-directional amplifier with adjustable RF-bandwidth. The first and the last channel of the transmission bandwidth can be set manually by means of rotary switches. The repeater has been designed for applications in medium sized rooms such as suites, offices and basements. A quality connection with a mobile phone can usually not be established in these rooms.

The repeater is equipped with a connector for an external receiving/transmitting antenna which provides the RF connection to the mobile. Connection to the BTS can be established via an outdoor antenna. Other components of the D.I.C.E. COAX system can also be connected to the repeater.

The final amplifiers are protected by individual level limiters, which allow the mobile unit to be operated in close proximity to the repeater. Third order intermodulation products are kept below the CEPT limit of -36 dBm constantly, even if the repeater receives the signals of more than one mobile unit.

System Diagram



EQUIPMENT: **MR303 Varia**PROJECT NO.: **1L0388RUS2**

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Lance Walker	DATE:10/16/2001

Test Results: Complies.**Measurement Data:**

Modulation	Frequency (MHz)	Rated Power (dBm)	Measured/Rated
2FSK	898.5	24.5	0.283
4FSK	898.5	24.5	0.283
iDEN	898.5	24.0	0.254
Voice	898.5	24.0	0.254
2FSK	937.5	7.7	0.006
4FSK	937.5	7.7	0.006
iDEN	937.5	8.0	0.006
Voice	937.5	7.8	0.006

Measurement Uncertainty: +/- 0.7 dB

Test Equipment: 1029-1030

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: Lance Walker	DATE:10/16/2001

Test Results: Complies.

Test Data: See attached graph(s).

Measurement Uncertainty: +/-1.7 dB

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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Data Plot

OBW 2FSK

Page 1 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal
Sample Number: 1
Location: Lab 1
Detector Type: Peak

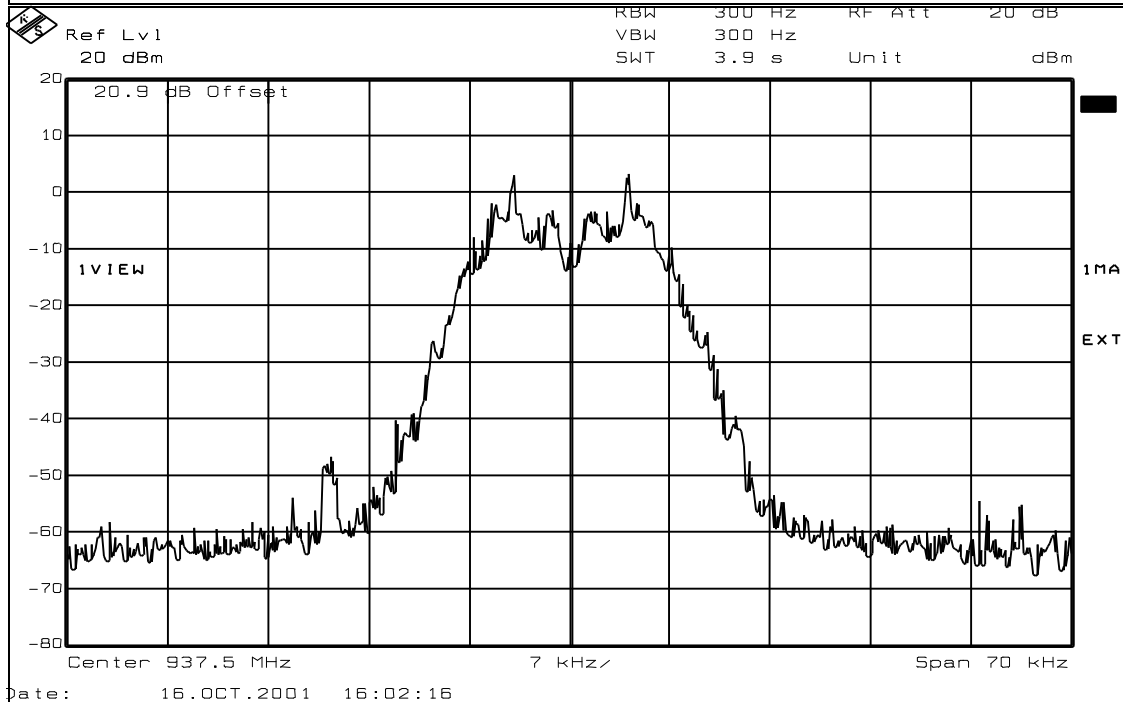
Complete X
Preliminary _____

RBW: Refer to plots
VBW: Refer to plots

Measurement
Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Notes: Downlink - Output Signal

EQUIPMENT: MR303 Varia

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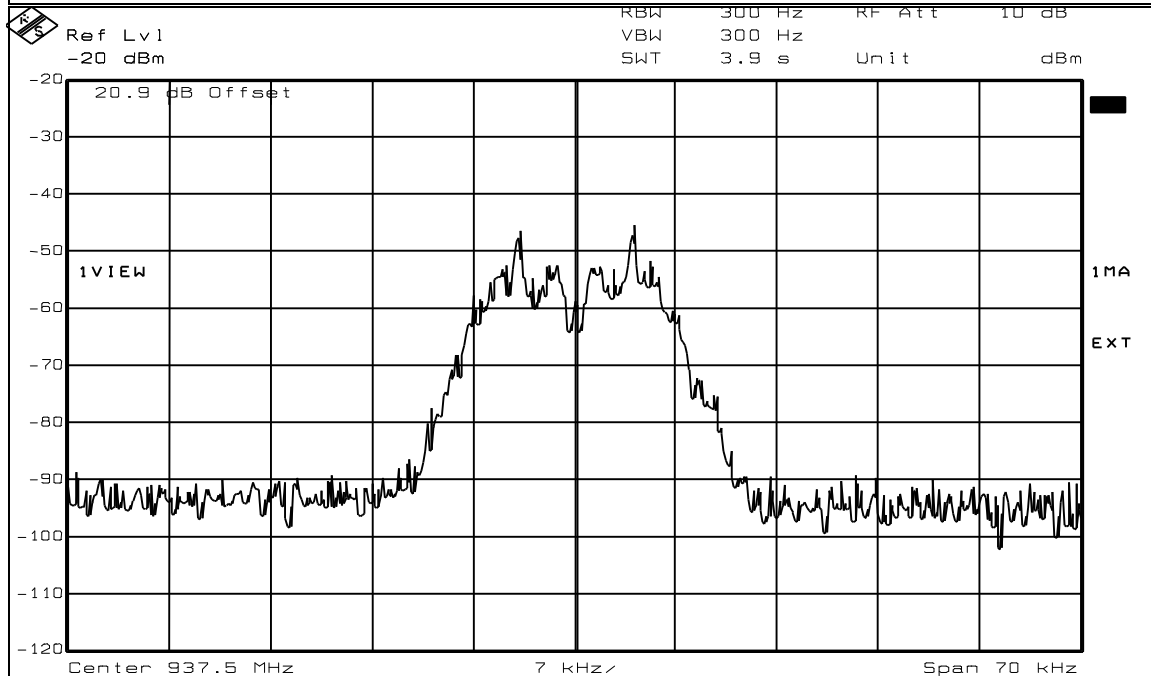
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Data Plot

OBW 2FSK

Page 2 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 16.OCT.2001 16:03:50

Notes: Downlink - Input Signal

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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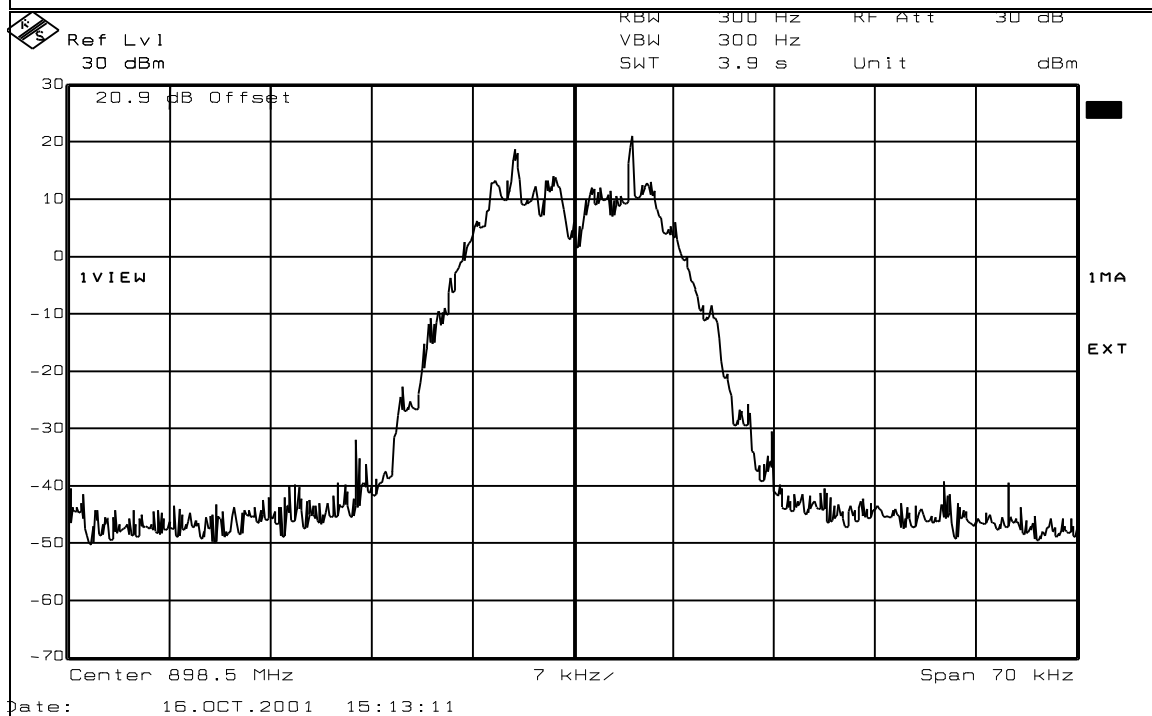
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Data Plot

OBW 2FSK

Page 3 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Notes: Uplink - Output Signal

EQUIPMENT: MR303 Varia

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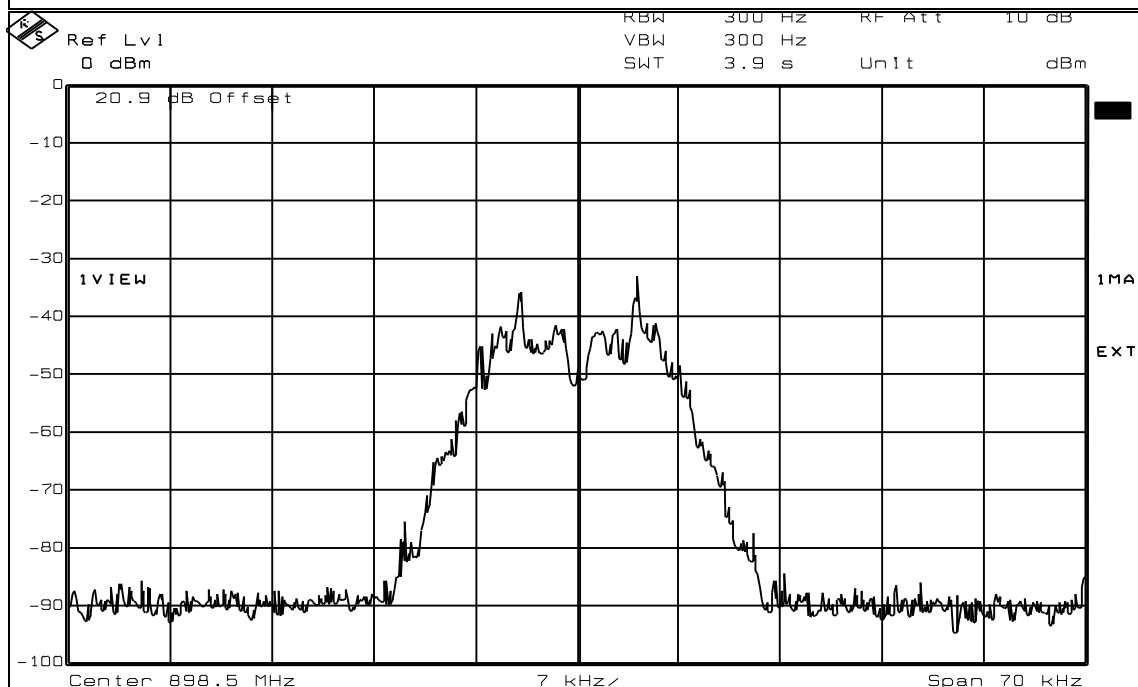
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Test Plot:

OBW 2FSK

Page 4 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 16.OCT.2001 15:30:06

Notes: Uplink - Input Signal

EQUIPMENT: MR303 Varia

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Data Plot

OBW 4FSK

Page 1 of 4

Job No.: 1L0388R Date: 10/16/2001 Complete X
Preliminary _____

Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50

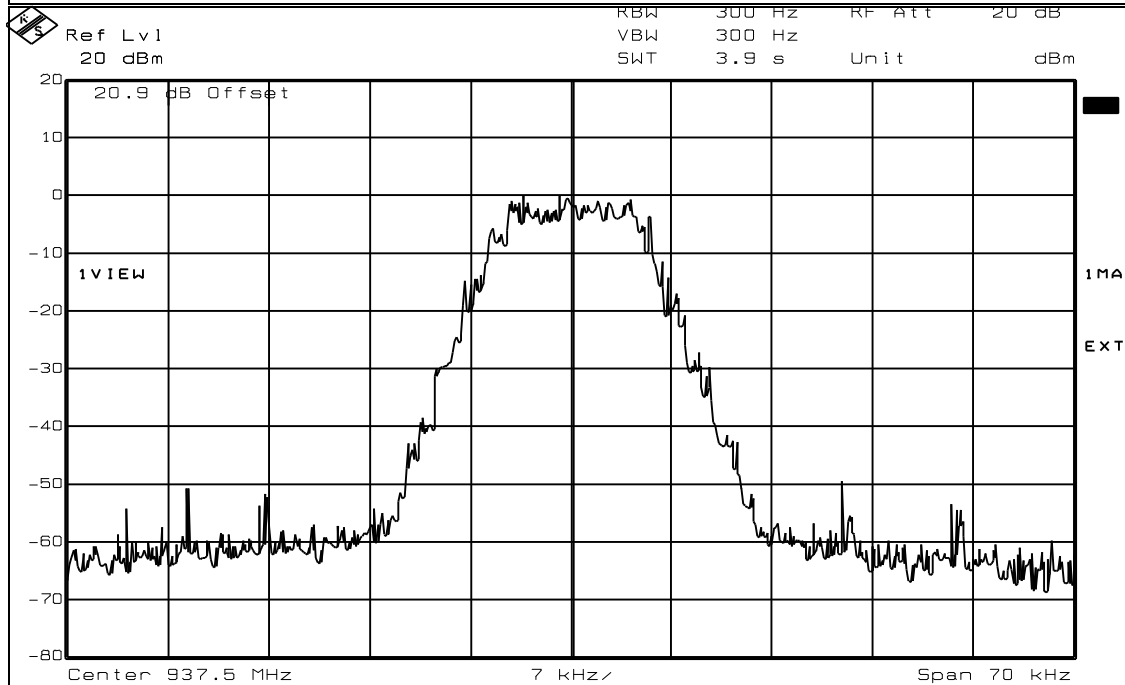
E.U.T.: Varia Repeater
Configuration: Normal

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 16.OCT.2001 15:48:54

Notes: Downlink - Output Signal

EQUIPMENT: MR303 Varia

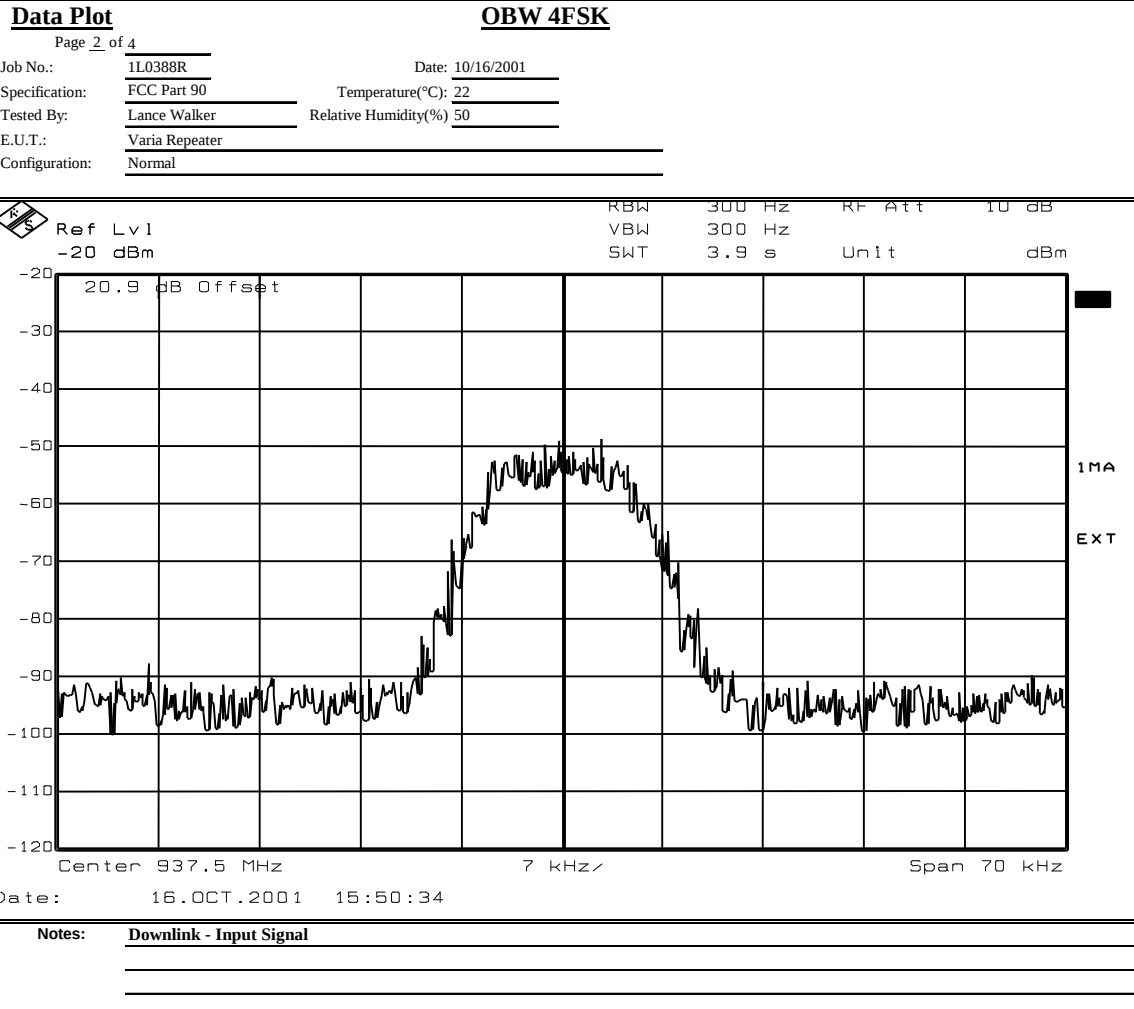
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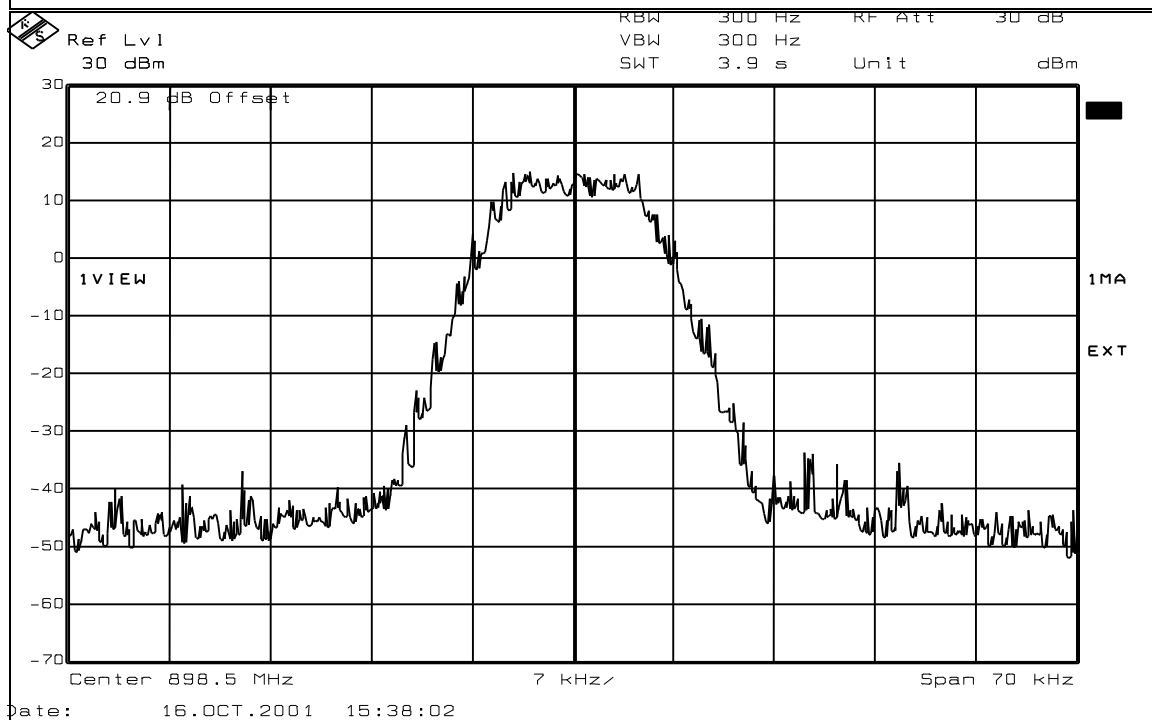
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Data Plot

OBW 4FSK

Page 3 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Notes: Uplink - Output Signal

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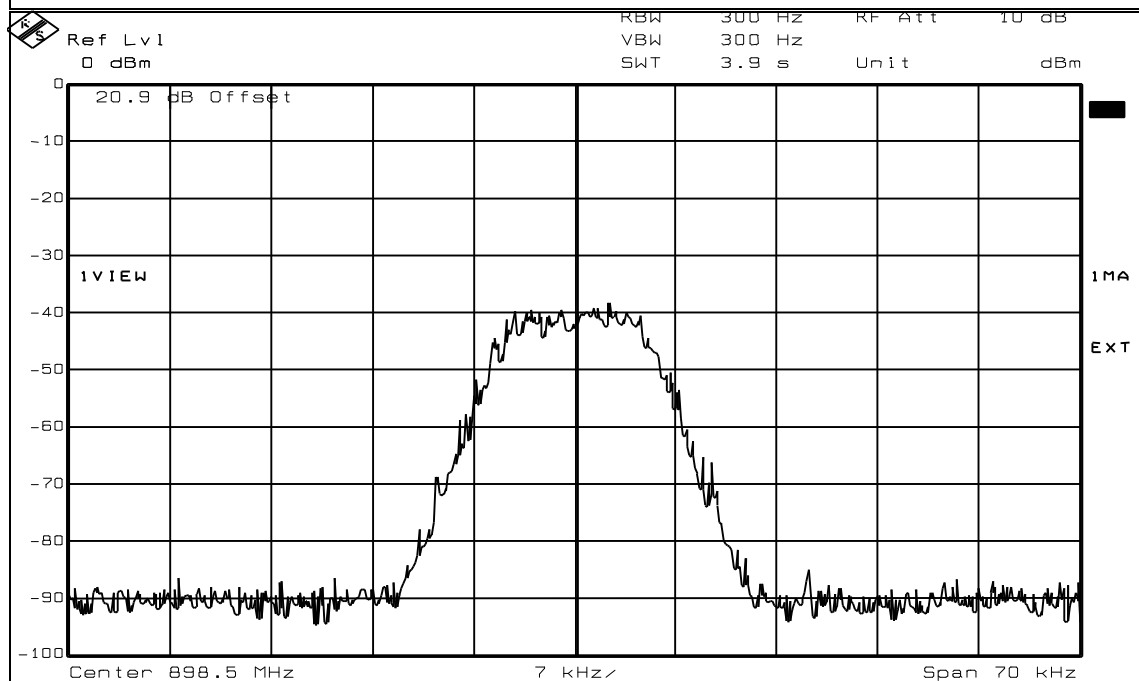
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Test Plot:

OBW 4FSK

Page 4 of 4

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 16.OCT.2001 15:32:35

Notes: Uplink - Input Signal

EQUIPMENT: MR303 Varia

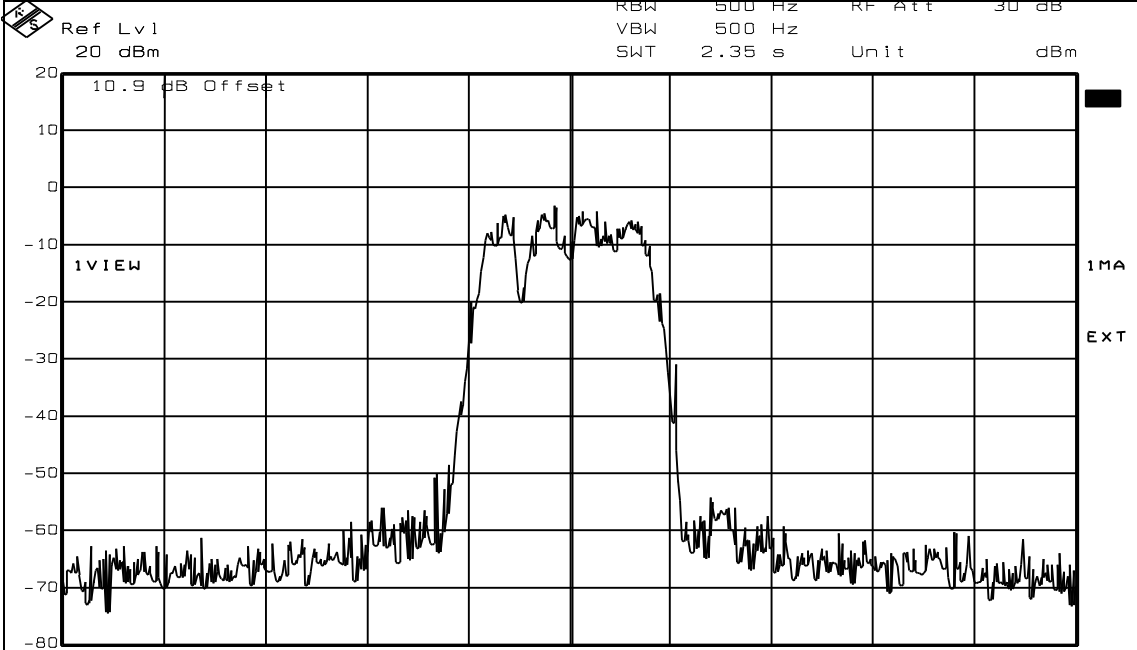
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Data Plot		OBW QAM	
Page 1 of 4			
Job No.:	1L0388R	Date:	10/17/2001
Specification:	FCC Part 90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%):	50
E.U.T.:	Varia Repeater		
Configuration:	Normal		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots
		Measurement	Distance: N/A m
Test Equipment Used			
Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	
Receiver:	1464	Cable #3:	
Attenuator #1:	1477	Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-3.6 dB		
			
Ref Lvl 20 dBm RBW 500 Hz RF Att 30 dB VBW 500 Hz SWT 2.35 s Unit dBm			
Center 937.0004125 MHz 11.71875 kHz Span 117.1875 kHz			
Date: 17.OCT.2001 9:19:43			
Notes: Downlink - Output Signal			

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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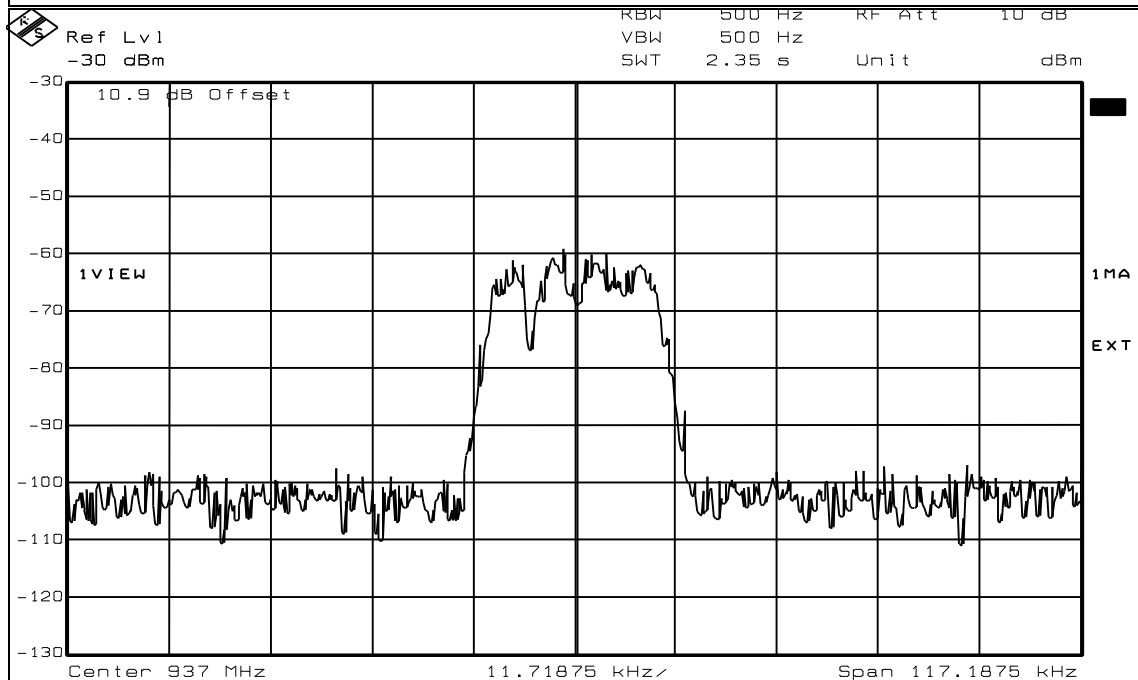
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Data Plot

Page 2 of 4

OBW QAM

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 17.OCT.2001 9:26:01

Notes: Downlink - Input Signal

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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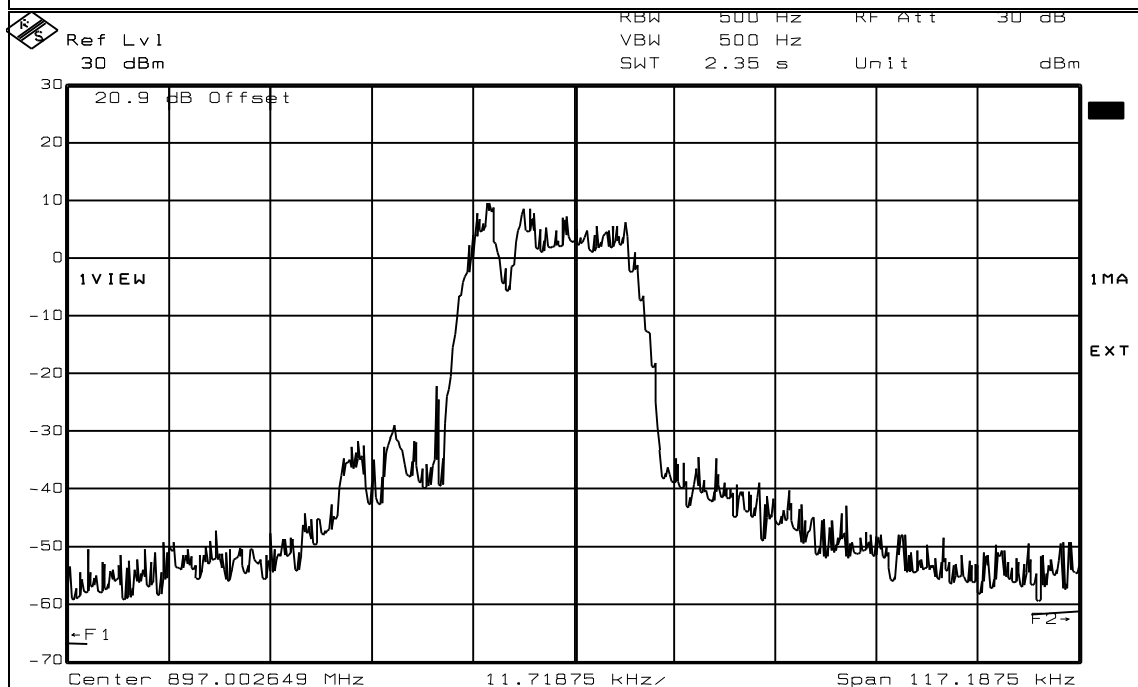
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Data Plot

OBW QAM

Page 3 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 17.OCT.2001 8:36:16

Notes: Uplink - Output Signal

EQUIPMENT: MR303 Varia

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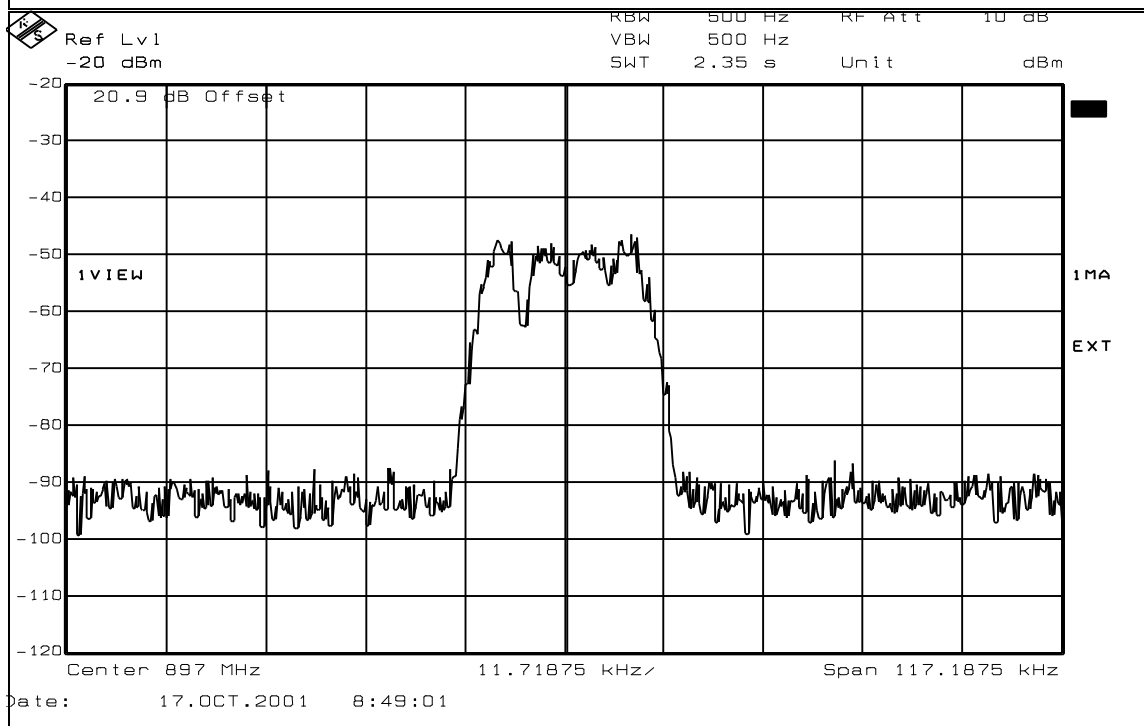
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Test Plot:

OBW QAM

Page 4 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Notes: Uplink - Input Signal

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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Data Plot

OBW VOICE

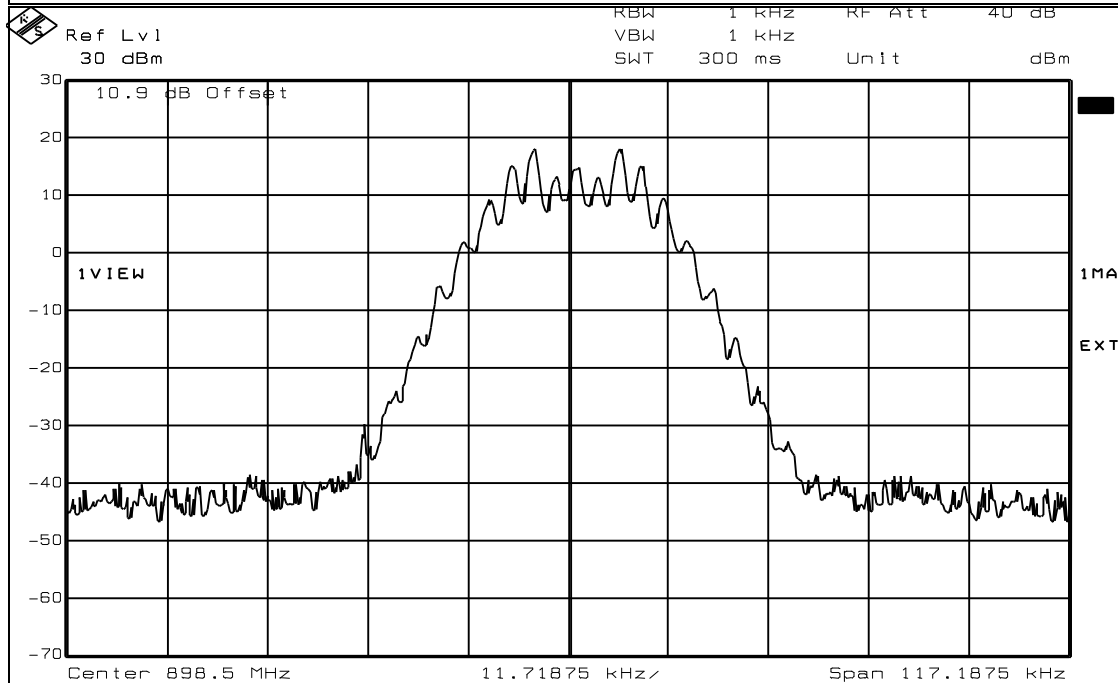
Page 1 of 4

Job No.: 1L0388R Date: 10/17/2001 Complete X
Preliminary _____

Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 17.OCT.2001 14:36:03

Notes: Downlink - Output Signal

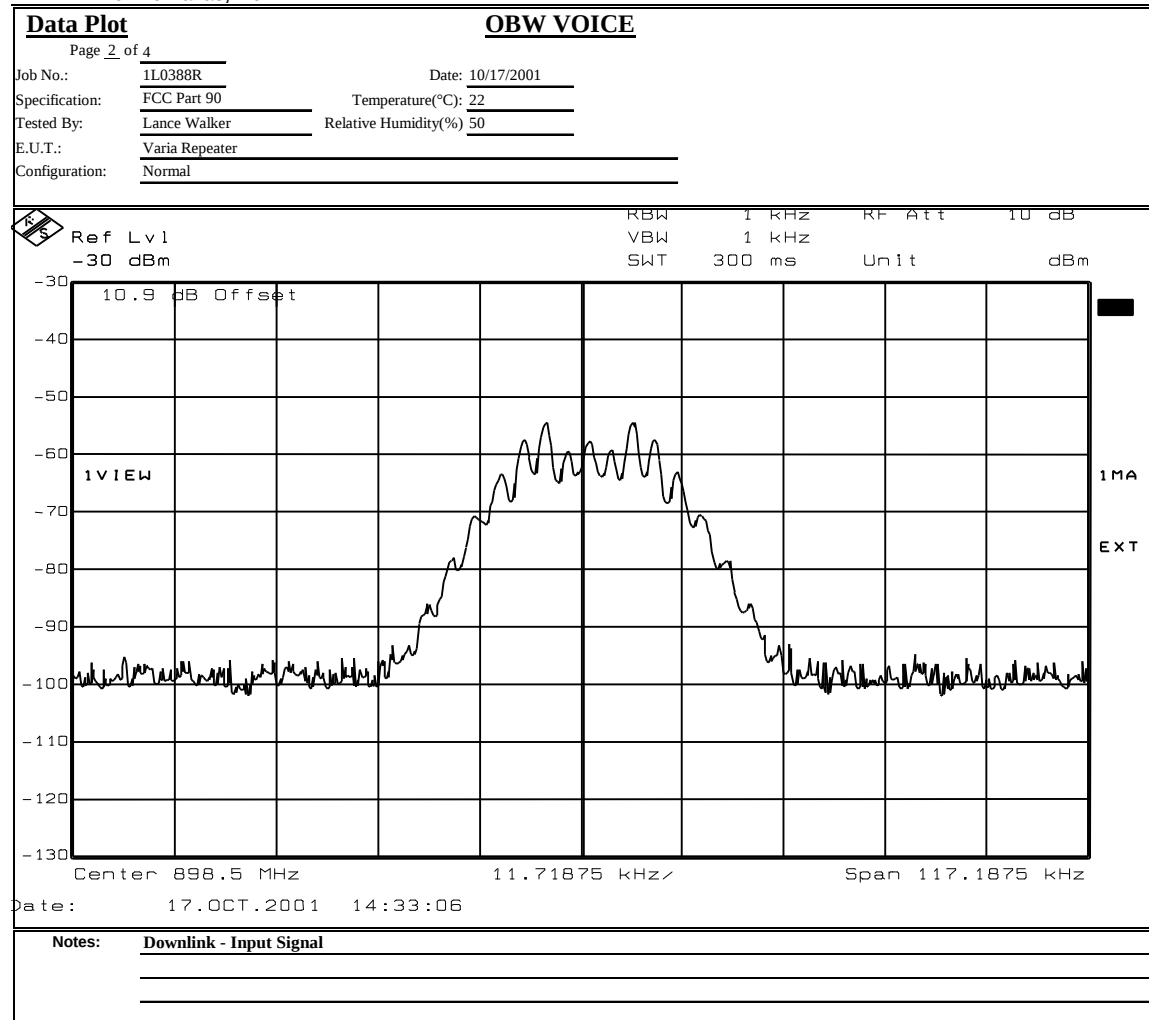
EQUIPMENT: MR303 Varia

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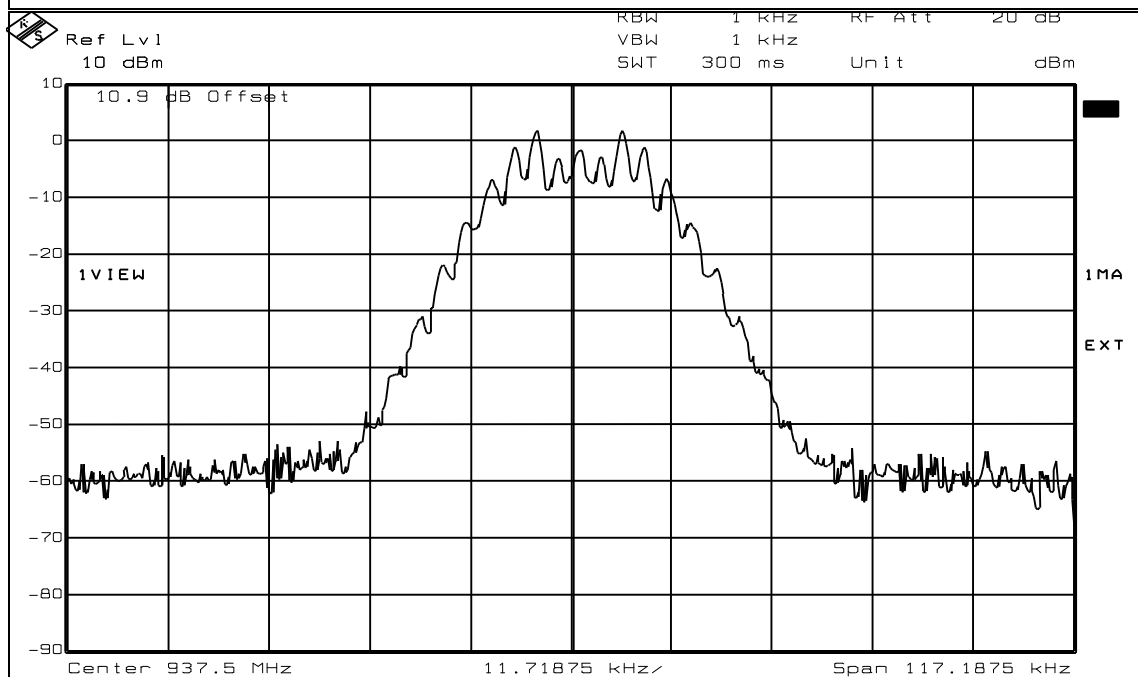
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Data Plot

OBW VOICE

Page 3 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 17.OCT.2001 14:30:43

Notes: Uplink - Output Signal

EQUIPMENT: MR303 Varia

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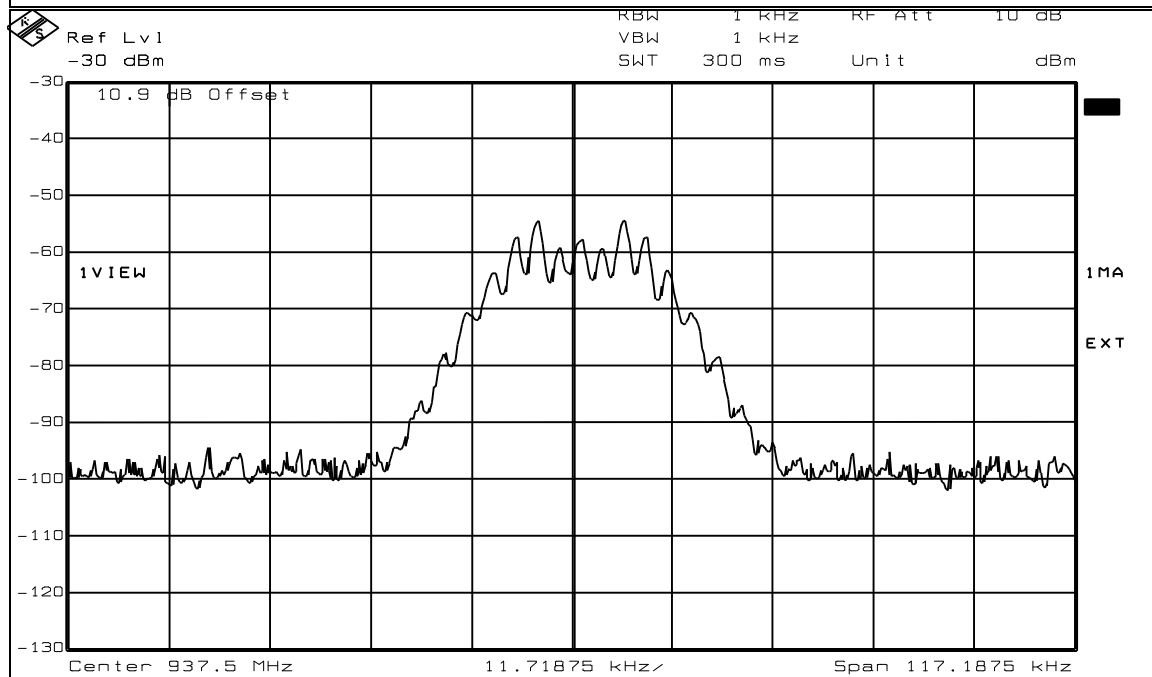
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Test Plot:

OBW VOICE

Page 4 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Notes: Uplink - Input Signal

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: Lance Walker	DATE:10/16/2001

Test Results: Complies.

Test Data: See attached graph(s).

Measurement Uncertainty: +/- 1.7 dBm

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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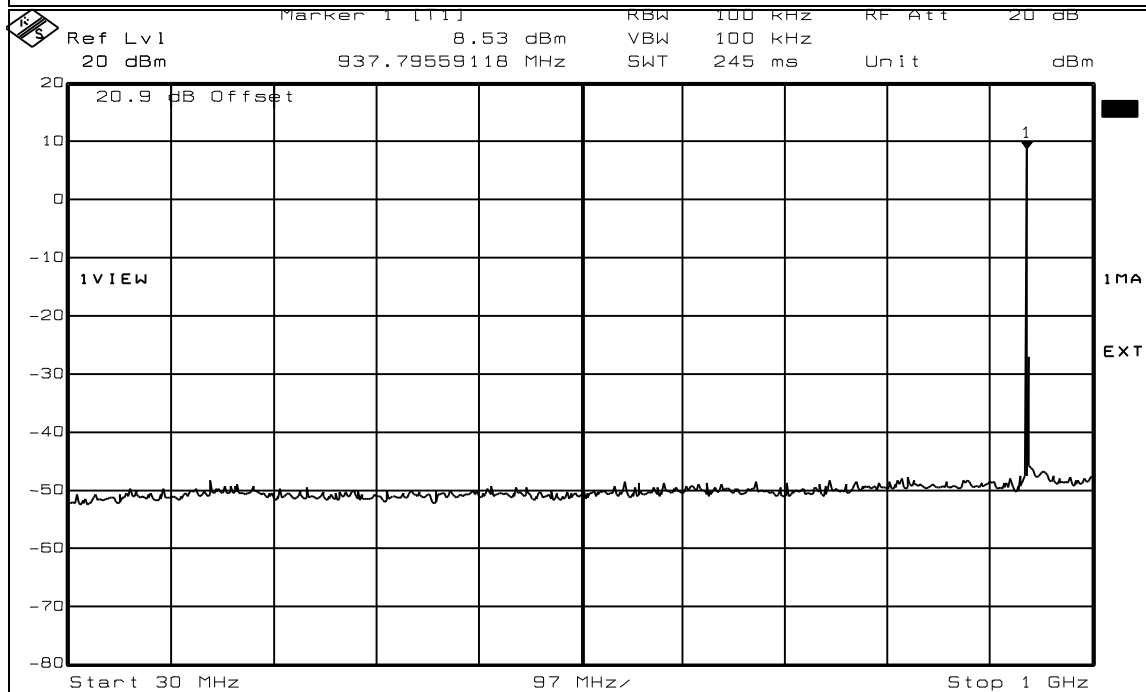
Data Plot

APSE 2FSK

Page 1 of 4
Job No.: 1L0388R Date: 10/16/01 Complete X
Specification: FCC Part 24 Temperature(°C): 22 Preliminary _____
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: 1469 Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 16.OCT.2001 15:58:02

Notes: DOWNLINK
MARKER INDICATES CARRIER

EQUIPMENT: MR303 Varia

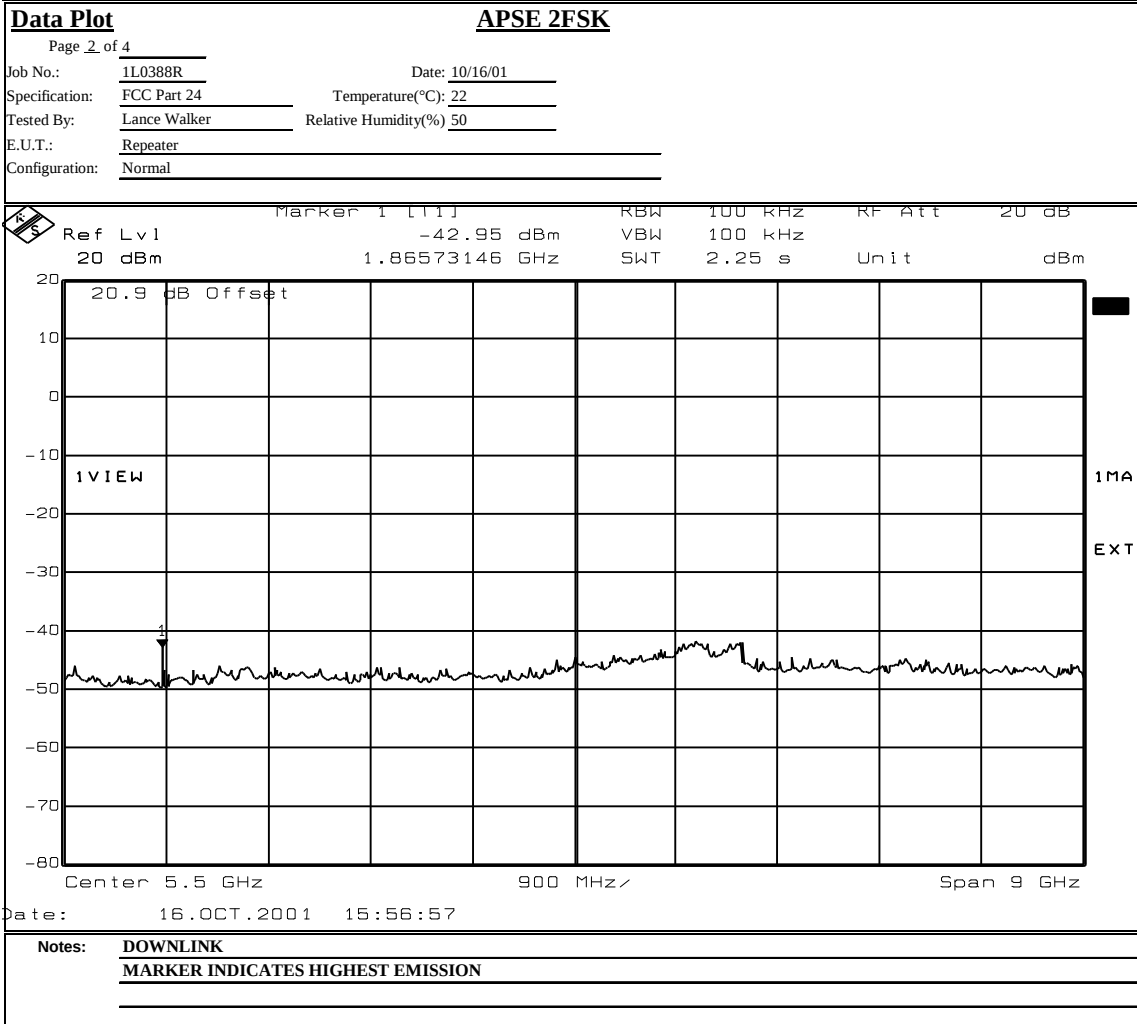
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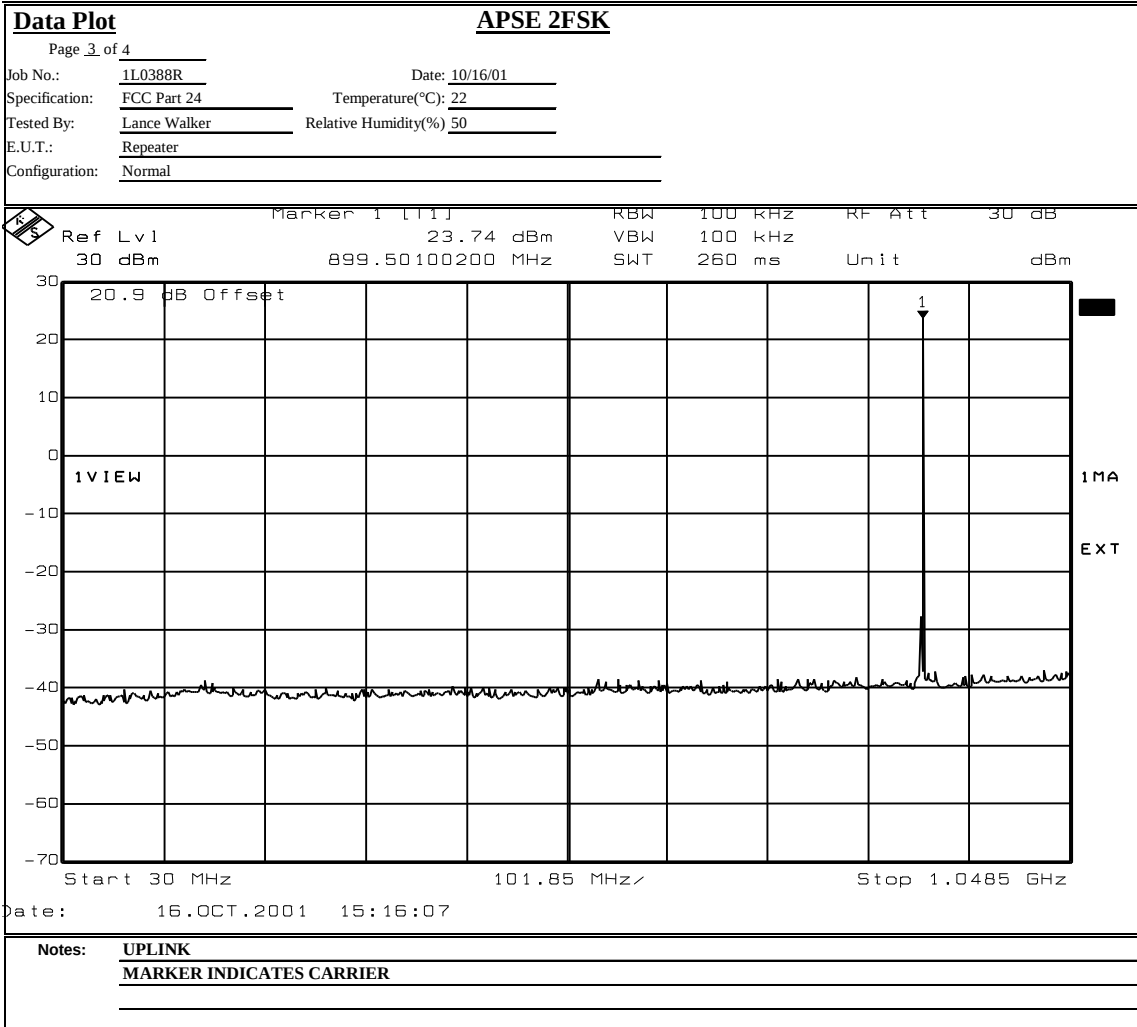
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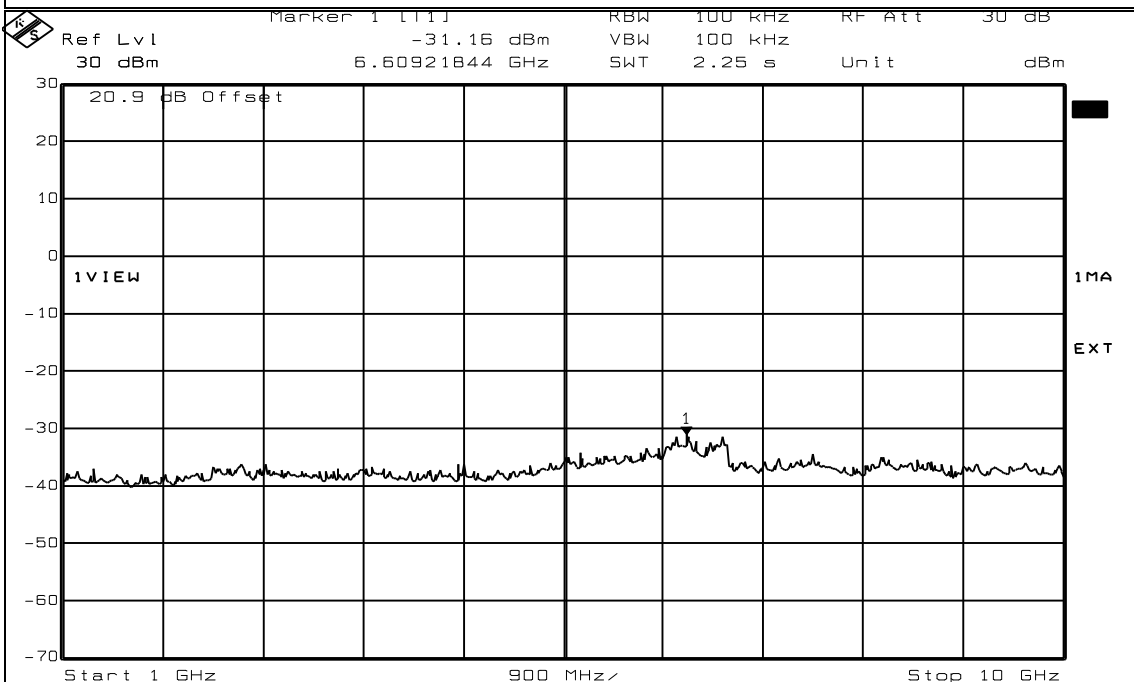
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Test Plot:

APSE 2FSK

Page 4 of 4
Job No.: 1L0388R Date: 10/16/01
Specification: FCC Part 24 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal



Date: 16.OCT.2001 15:17:12

Notes: UPLINK
MARKER INDICATES HIGHEST EMISSION

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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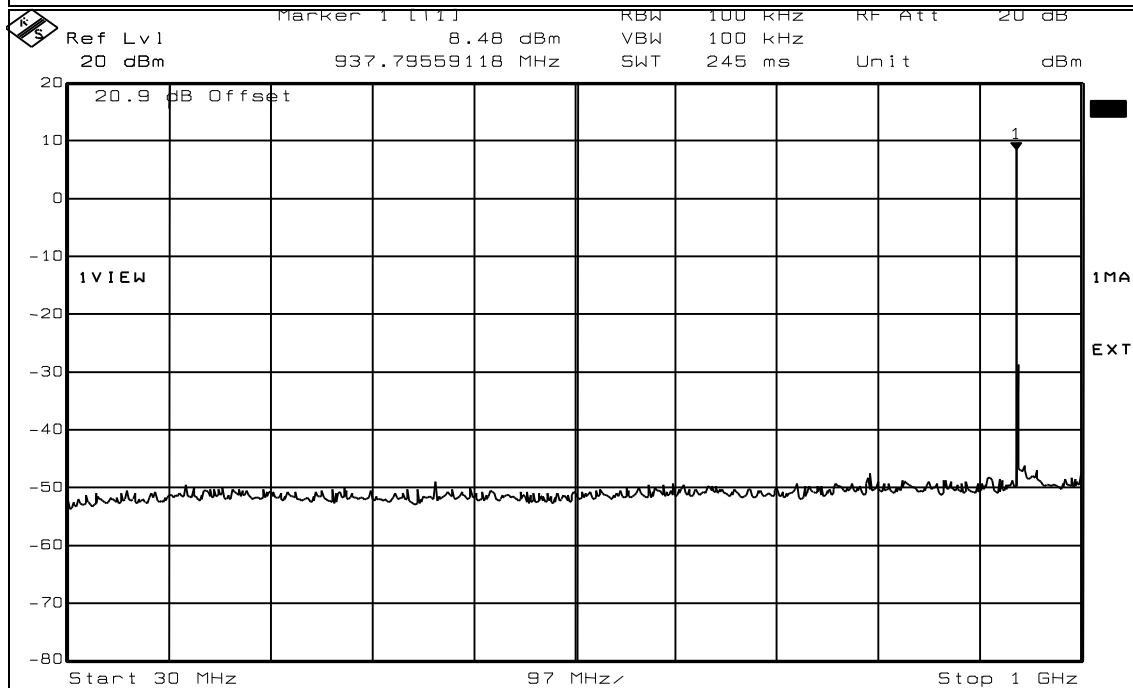
Data Plot

APSE 4FSK

Page 1 of 4
Job No.: 1L0388R Date: 10/16/01 Complete X
Specification: FCC Part 24 Temperature(°C): 22 Preliminary _____
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: 1469 Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 16.OCT.2001 15:53:13

Notes: DOWNLINK
MARKER INDICATES CARRIER

EQUIPMENT: MR303 Varia

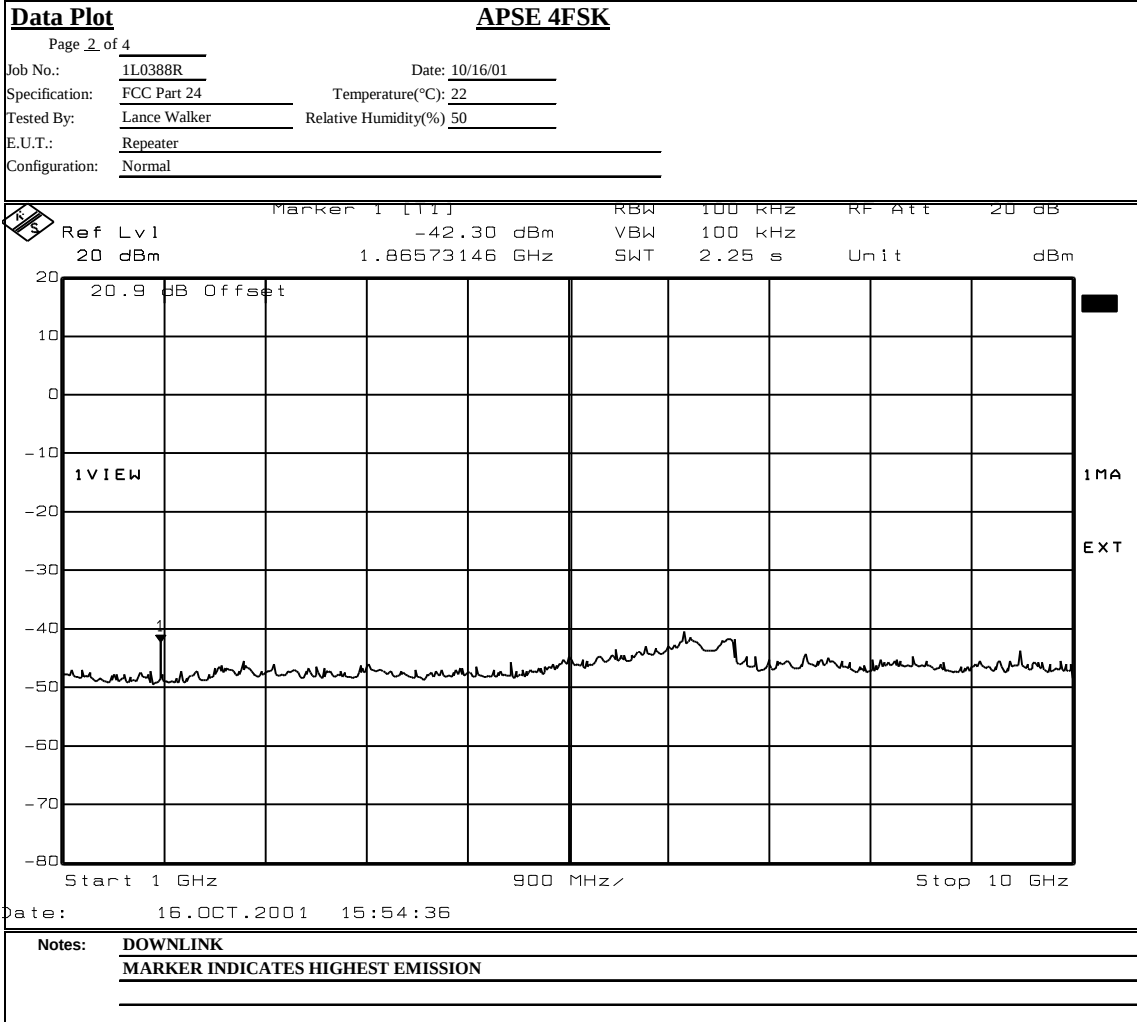
PROJECT NO.: 1L0388RUS2



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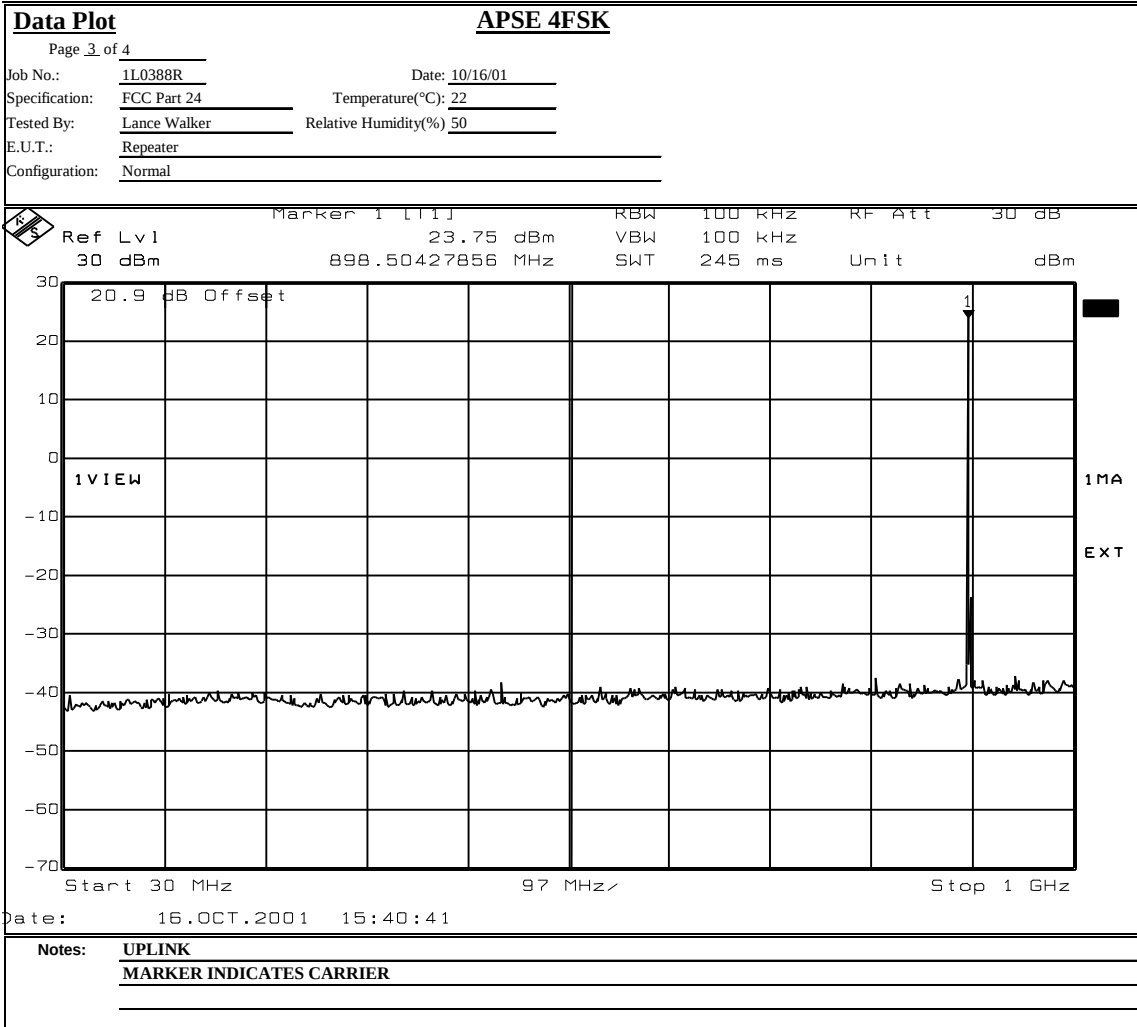
EQUIPMENT: MR303 Varia

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EQUIPMENT: MR303 Varia

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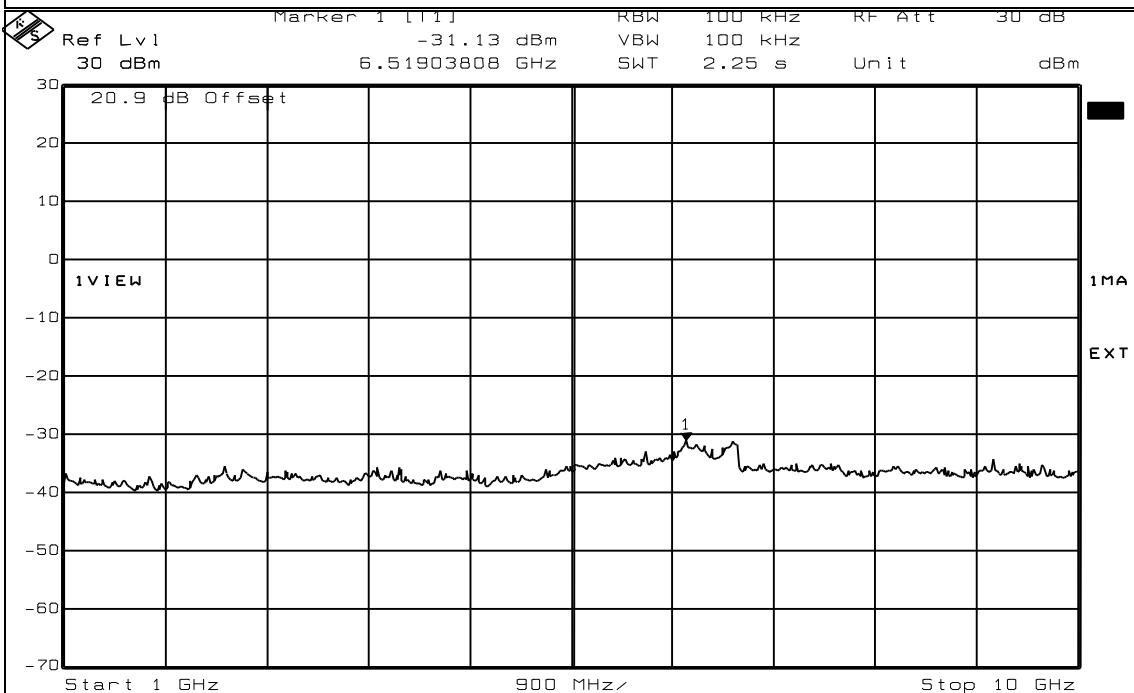
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Test Plot:

APSE 4FSK

Page 4 of 4
Job No.: 1L0388R Date: 10/16/01
Specification: FCC Part 24 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal



Date: 16.OCT.2001 15:41:59

Notes: UPLINK
MARKER INDICATES HIGHEST EMISSION

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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Data Plot

APSE QAM

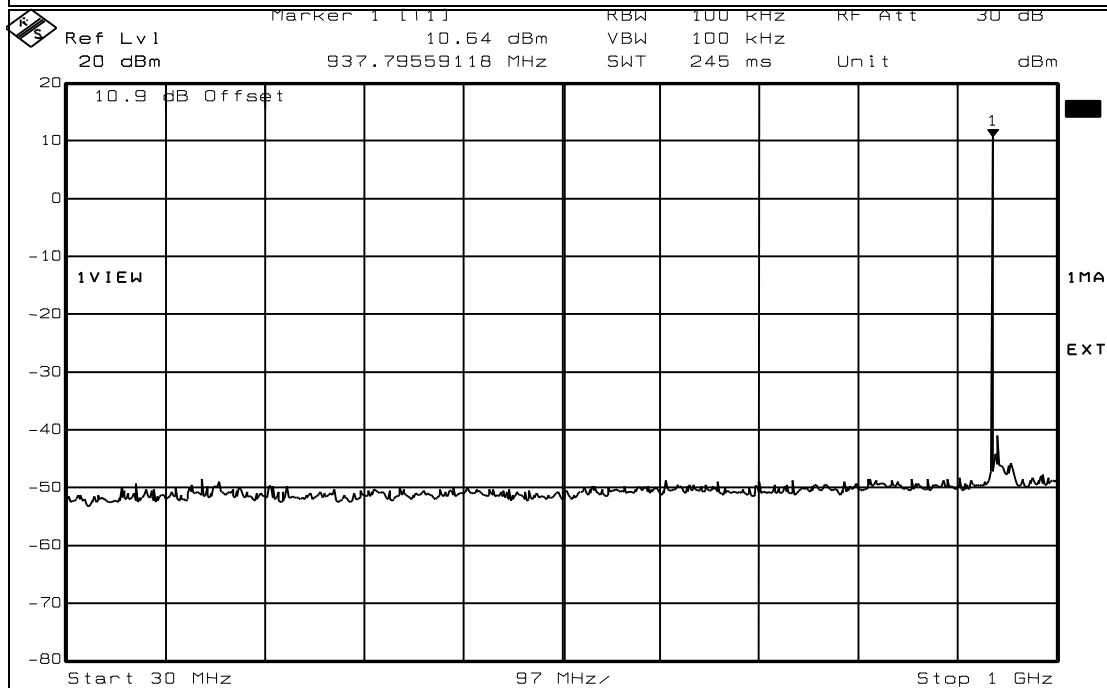
Page 1 of 4

Job No.: 1L0388R Date: 10/17/01 Complete X
Preliminary _____

Specification: FCC Part 24 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1477 Cable #4: _____
Attenuator #2: 1469 Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 17.OCT.2001 9:21:13

Notes: DOWNLINK
MARKER INDICATES CARRIER

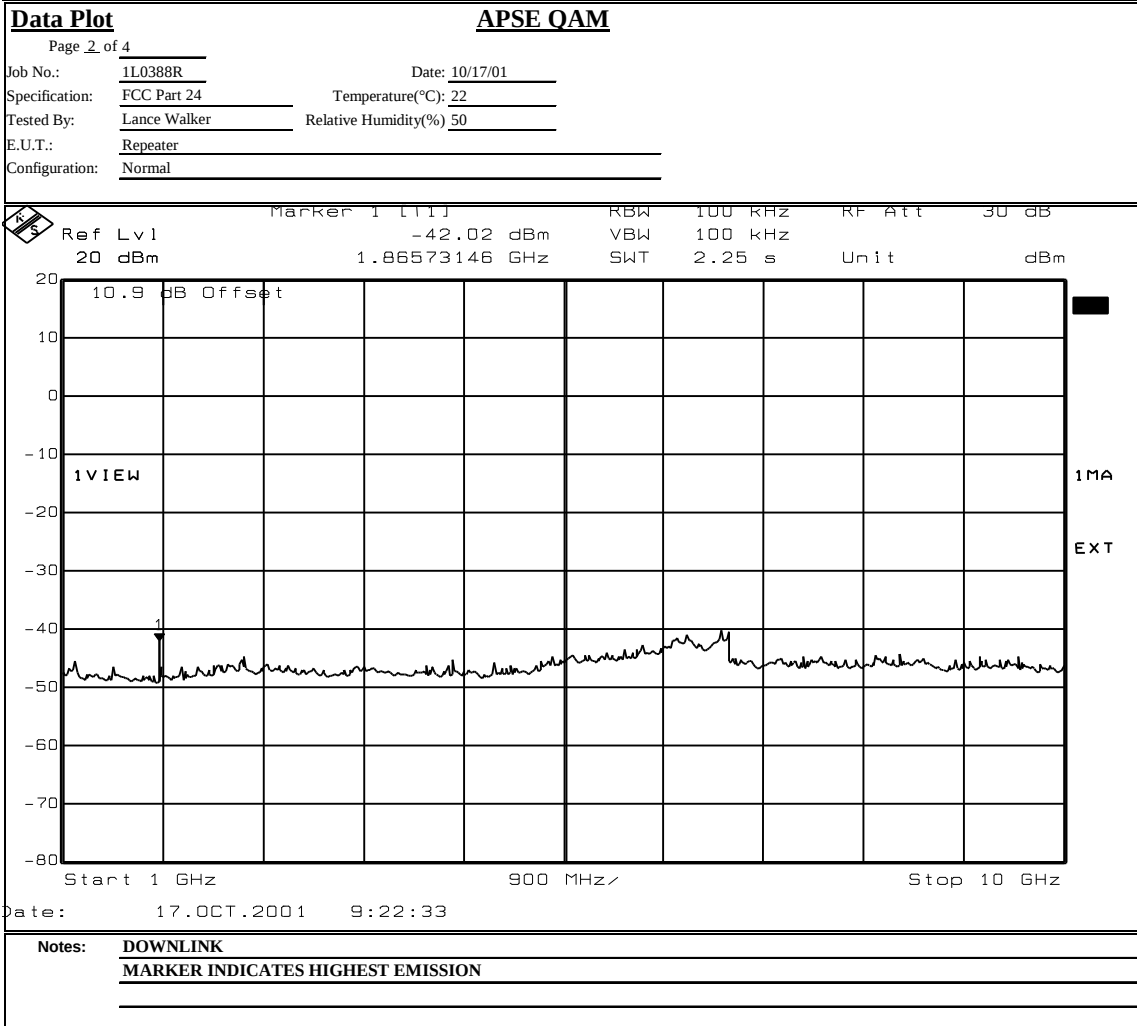
EQUIPMENT: MR303 Varia

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EQUIPMENT: MR303 Varia

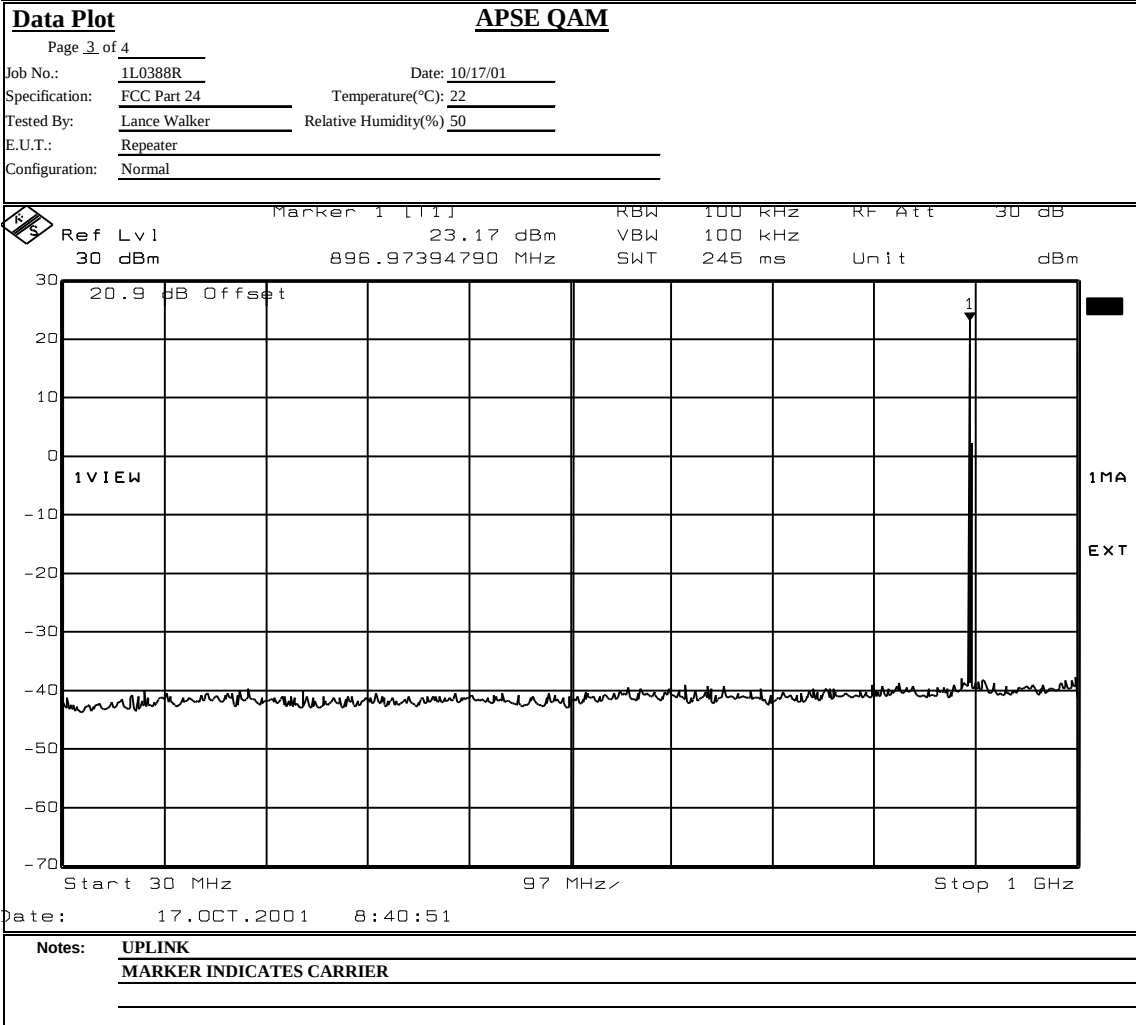
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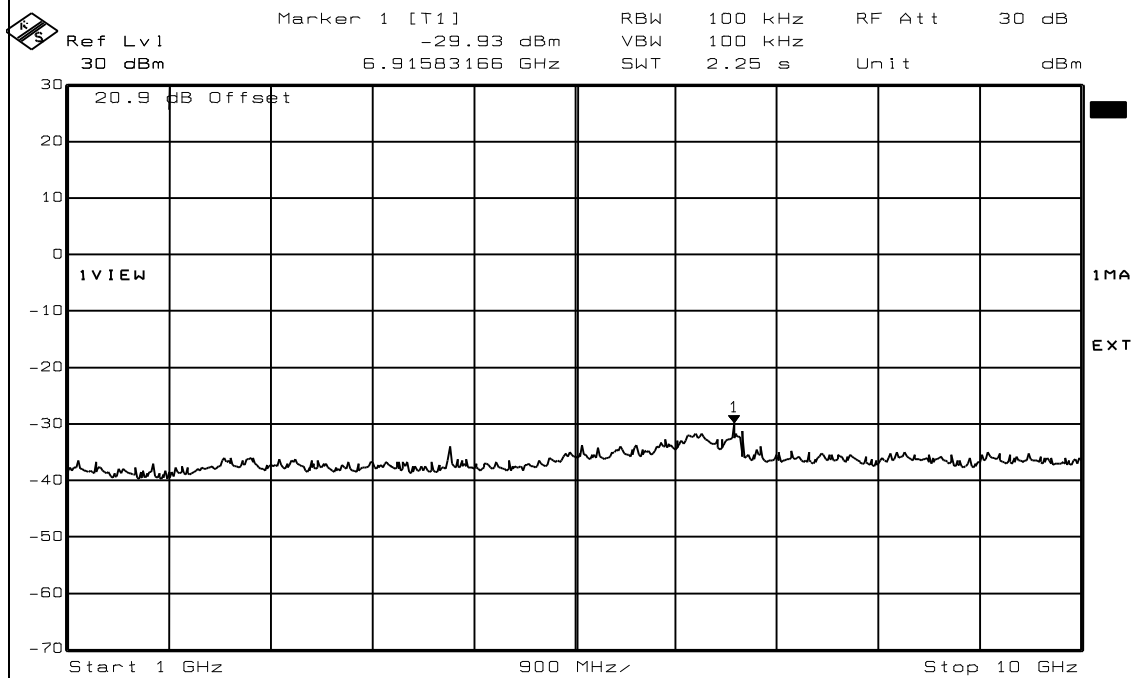
Nemko Dallas, Inc.

Test Plot:

APSE QAM

Page 4 of 4

Job No.: 1L0388R Date: 10/17/01
Specification: FCC Part 24 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Repeater
Configuration: Normal



Date: 17.OCT.2001 8:43:13

Notes: UPLINK
MARKER INDICATES HIGHEST EMISSION

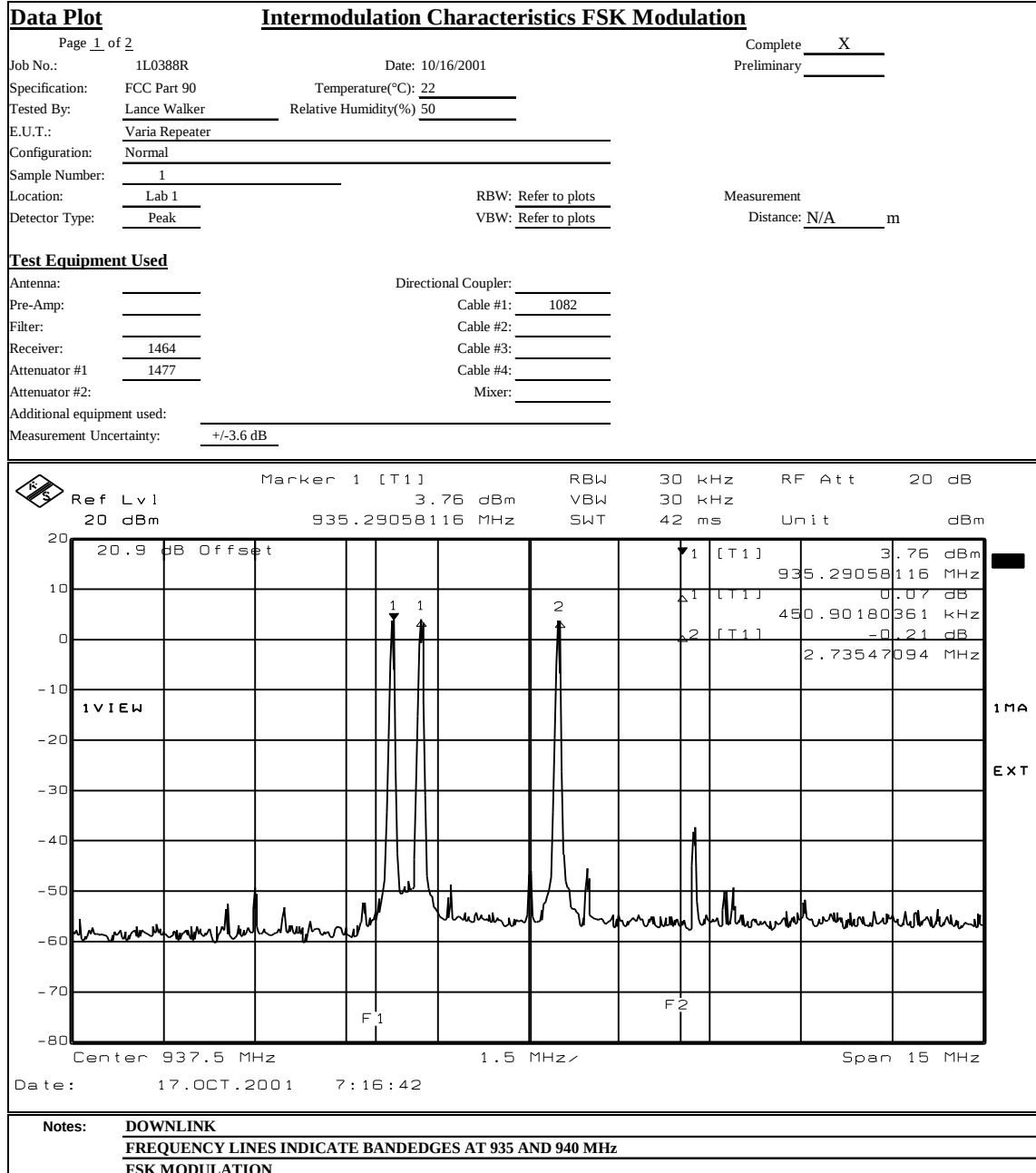
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PROJECT NO.: 1L0388RUS2



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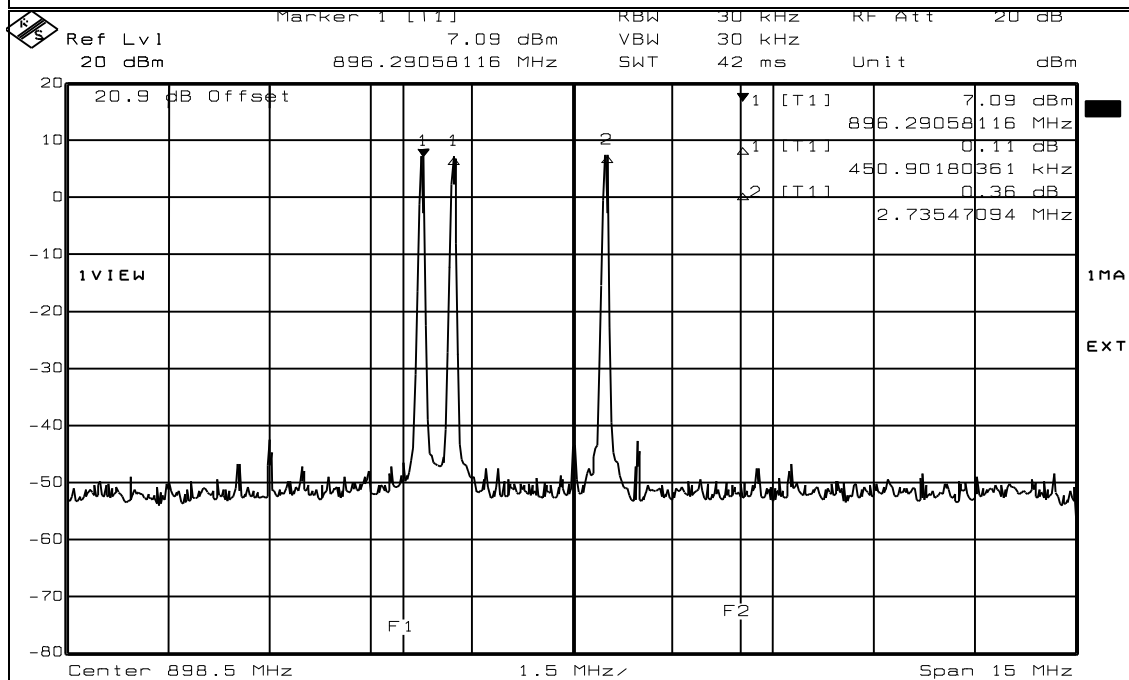
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Data Plot

Page 2 of 2

Intermodulation Characteristics FSK Modulation

Job No.: 1L0388R Date: 10/16/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 17.OCT.2001 7:29:51

Notes: UPLINK

FREQUENCY LINES INDICATE BANDEDGES AT 896 AND 901 MHz

FSK MODULATION

EQUIPMENT: MR303 Varia

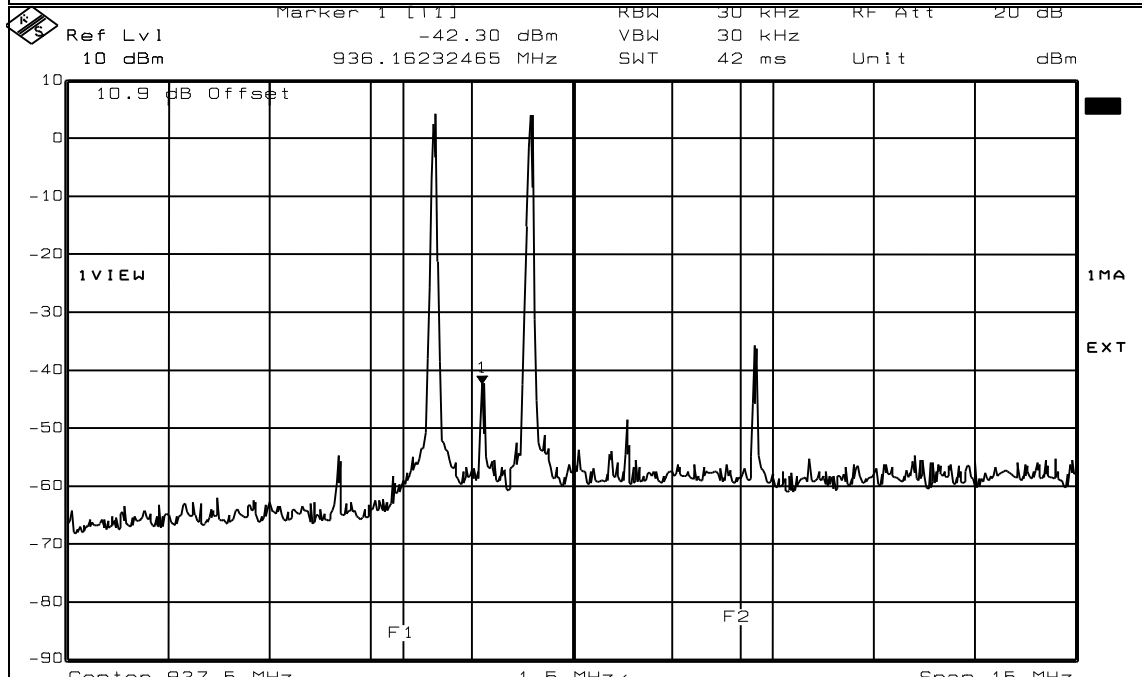
PROJECT NO.: 1L0388RUS2



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Data Plot		Intermod QAM	
Page 1 of 4			
Job No.:	1L0388R	Date:	10/17/2001
Specification:	FCC Part 90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%):	50
E.U.T.:	Varia Repeater		
Configuration:	Normal		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots
		Measurement	Distance: N/A m
Complete ☒		Preliminary ☐	
Test Equipment Used			
Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	
Receiver:	1464	Cable #3:	
Attenuator #1:	1477	Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-3.6 dB		
			
Date: 17.OCT.2001 9:45:40			
Notes: Downlink - Low End			
Marker indicates signal from signal generator			
F1 and F2 represent bandedges			

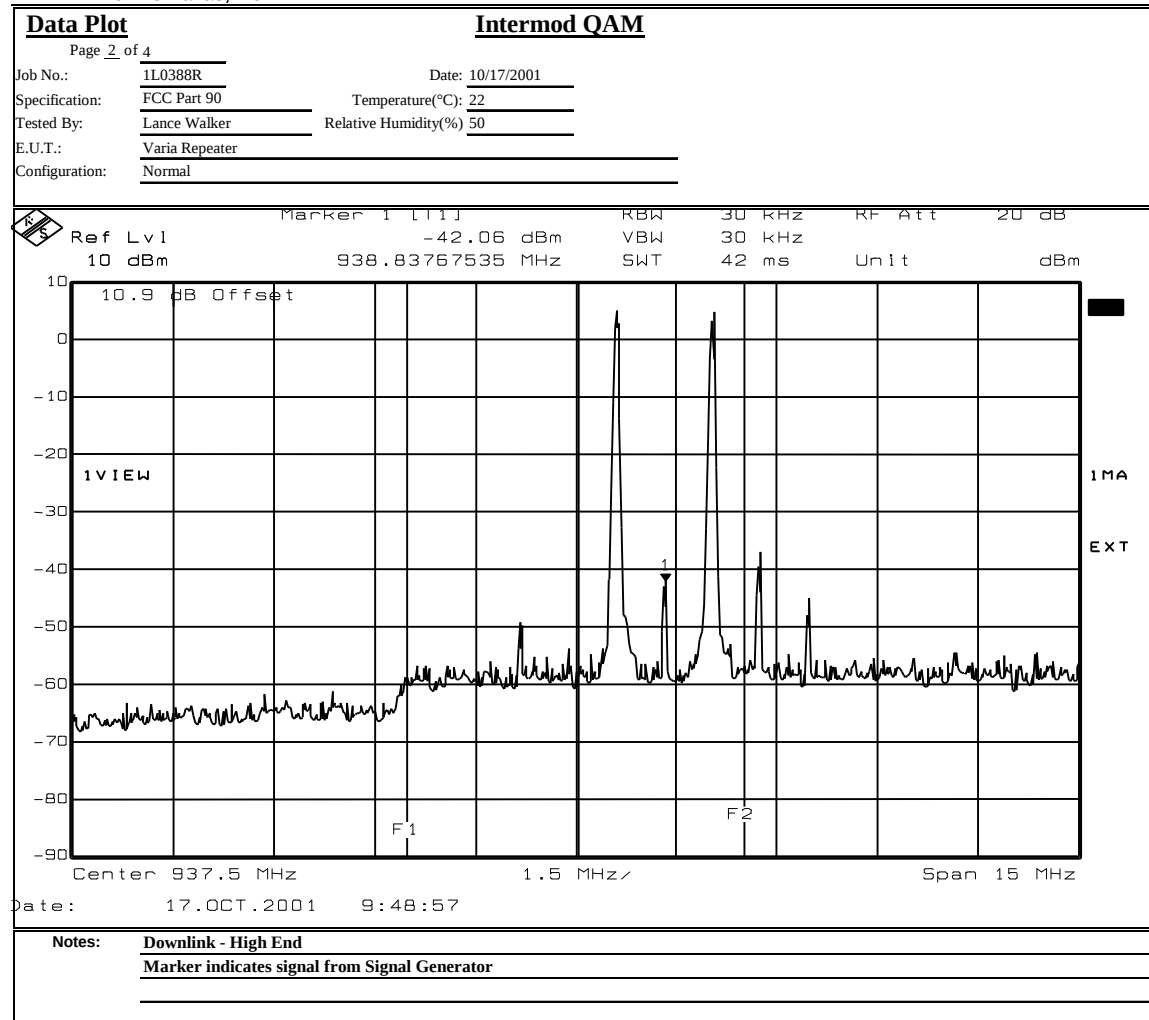
EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2



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Dallas Headquarters:

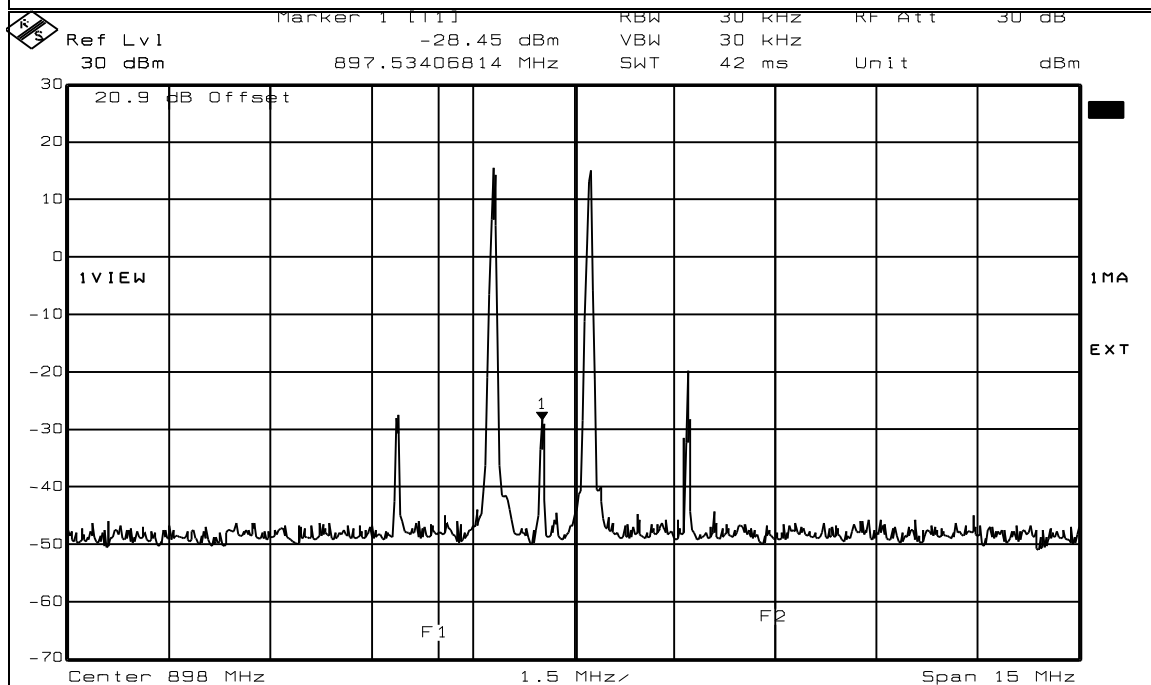
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Data Plot

Intermod QAM

Page 3 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Date: 17.OCT.2001 9:59:53

Notes: Uplink - Low End

Marker indicates signal from signal generator

F1 and F2 represent bandedges



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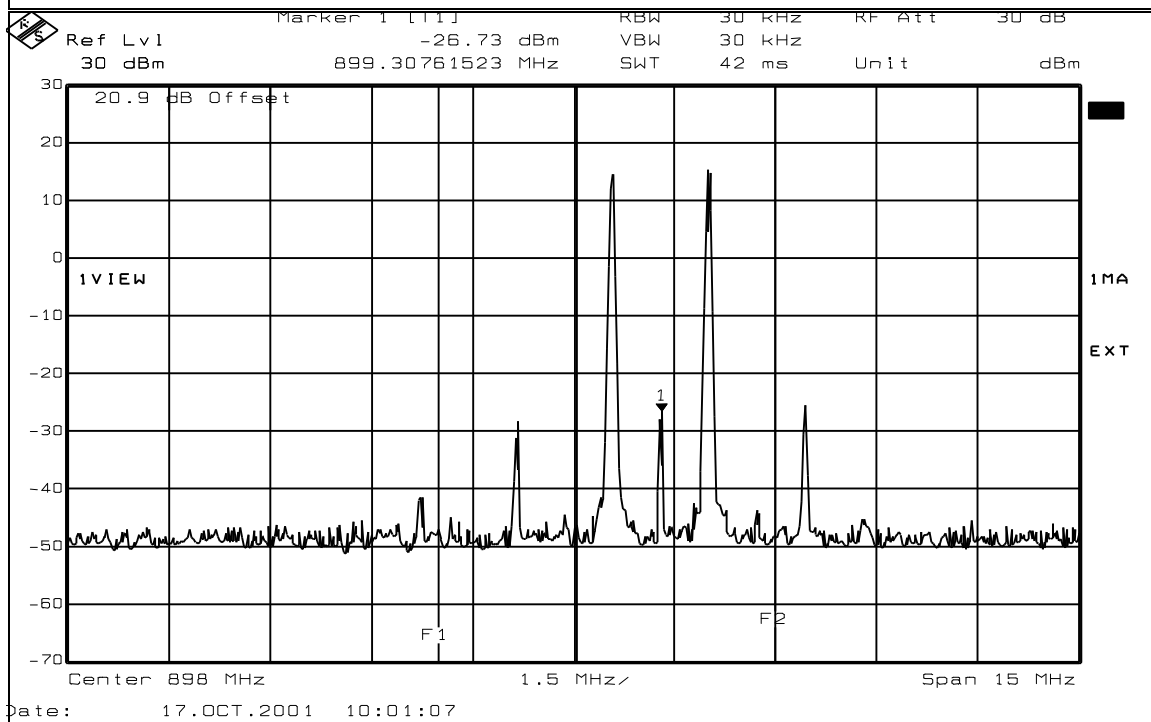
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Test Plot:

Intermod QAM

Page 4 of 4

Job No.: 1L0388R Date: 10/17/2001
Specification: FCC Part 90 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Varia Repeater
Configuration: Normal



Notes: Downlink - Low End
Marker indicates signal from signal generator
F1 and F2 represent bandedges

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: Lance Walker	DATE:08/31/2001

Test Results: Complies.

Test Data: See attached table.

Note: See page A5 for applicable limit.

EQUIPMENT: **MR303 Varia**

PROJECT NO.: 1L0388RUS2

Test Data - Radiated Emissions



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[illegible]

EQUIPMENT: **MR303 Varia**

PROJECT NO.: 1L0388RUS2



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Field Strength of Spurious Emissions

Page <u>1</u> of _____		Complete <u>X</u>
Job No.:	1L0388R	Preliminary _____
	Date: 8/31/01	
Specification:	Temperature(°C): <u>22</u>	
Tested By:	Lance Walker _____	Relative Humidity(%) <u>50</u>
E.U.T.:	Repeater _____	
Configuration:	Normal Downlink _____	
Sample No:	<u>1</u>	
Location:	AC 3 _____	RBW: <u>1 MHz</u>
Detector Type:	Peak _____	VBW: <u>1 MHz</u>
		Measurement Distance: <u>3 m</u>

Test Equipment Used

Antenna:	993	Directional Coupler:	
Pre-Amp:	1016	Cable #1:	1043
Filter:		Cable #2:	1082
Receiver:	1464	Cable #3:	1484
Attenuator #1	1470	Cable #4:	1485
Attenuator #2:		Mixer:	
Additional equipment used:	1053		
Measurement Uncertainty:	+/-3.6 dB		

[illegible]

Photographs of Test Setup

FRONT VIEW



REAR VIEW



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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO. 2.995
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Measurement Data: See attached tables.

Not Applicable

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2

Section 8. Test Equipment List

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	09/17/01
1477	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W5	NONE	CBU
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1470	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU
1043	Flexible cable 1m	Astrolab Inc. 32027-2-29094K-1M	0	01/29/01
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1063	Low Noise Amplifier 20-1000mhz	MiteQ AM-1430	422057	02/27/01
1029	PEAK POWER METER	HP 8900D	3303U0012	03/12/01
1030	PEAK POWER SENSOR	HP 84811A	2539A03573	03/12/01

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

EQUIPMENT: **MR303 Varia**

PROJECT NO.: **1L0388RUS2**

ANNEX A - TEST METHODOLOGIES

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

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

Method Of Measurement:

Detachable Antenna:

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

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

PROJECT NO.: 1L0388RUS2

PARA. NO.: 2.991

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

VBW: $\Rightarrow$ RBW

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

EQUIPMENT: **MR303 Varia**PROJECT NO.: **1L0388RUS2**

NAME OF TEST: Occupied Bandwidth**PARA. NO.: 2.989****Minimum Standard:** Para. No. 90.210, see table 1 below for applicable mask.**Table 1**

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

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

An example of attenuation requirement of $50 + 10 \log P$ is equivalent to -20 dBm (1×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain)

P = 10^{-5} Watts (Maximum spurious output power)

R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R} = E = \frac{\sqrt{30 \times 1.64 \times 10^{-5}}}{3} = 0.00739 \text{ V / m} = 77.4 \text{ dBmV / m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)

P = 1×10^{-5} Watts (Maximum spurious output power)

R = 3m (Measurement Distance)

$$E = 77.4 - 20 \log \sqrt{1.64} = 75.2 \text{ dBmV / m@3m}$$

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dBμV/m@3m	82.2 dBμV/m@3m
D,J	-20dBm	77.4 dBμV/m@3m	75.2 dBμV/m@3m
E,F,K	-25dBm	72.4 dBμV/m@3m	70.2 dBμV/m@3m

EQUIPMENT: MR303 Varia

PROJECT NO.: 1L0388RUS2

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	-	-	-

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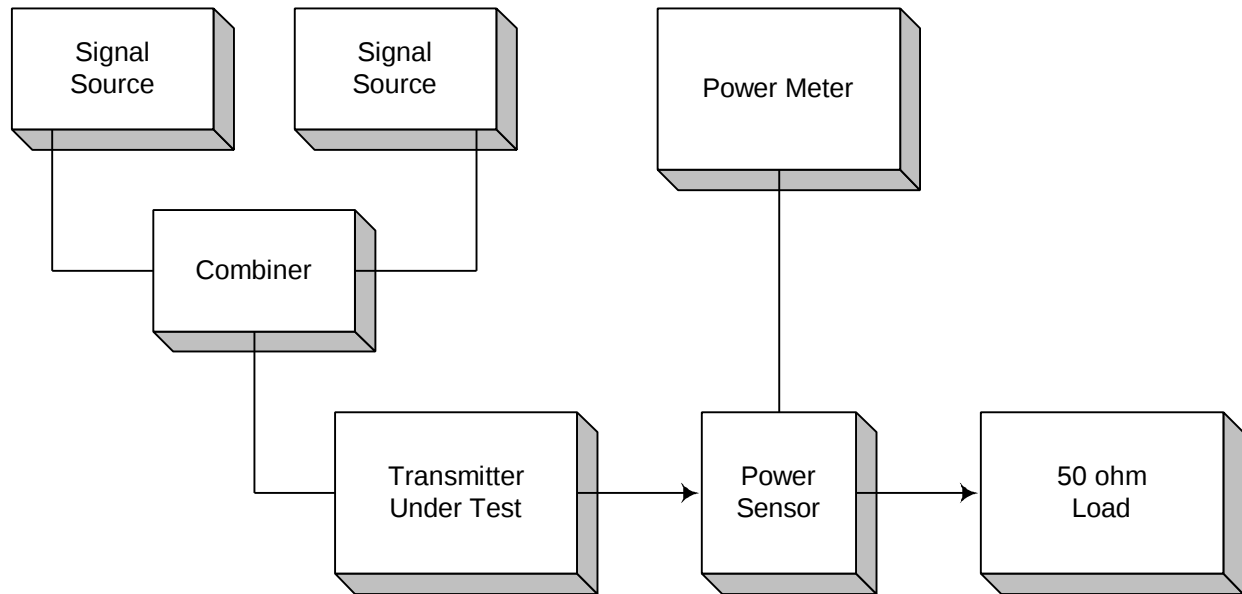
FCC PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER

EQUIPMENT: **MR303 Varia**

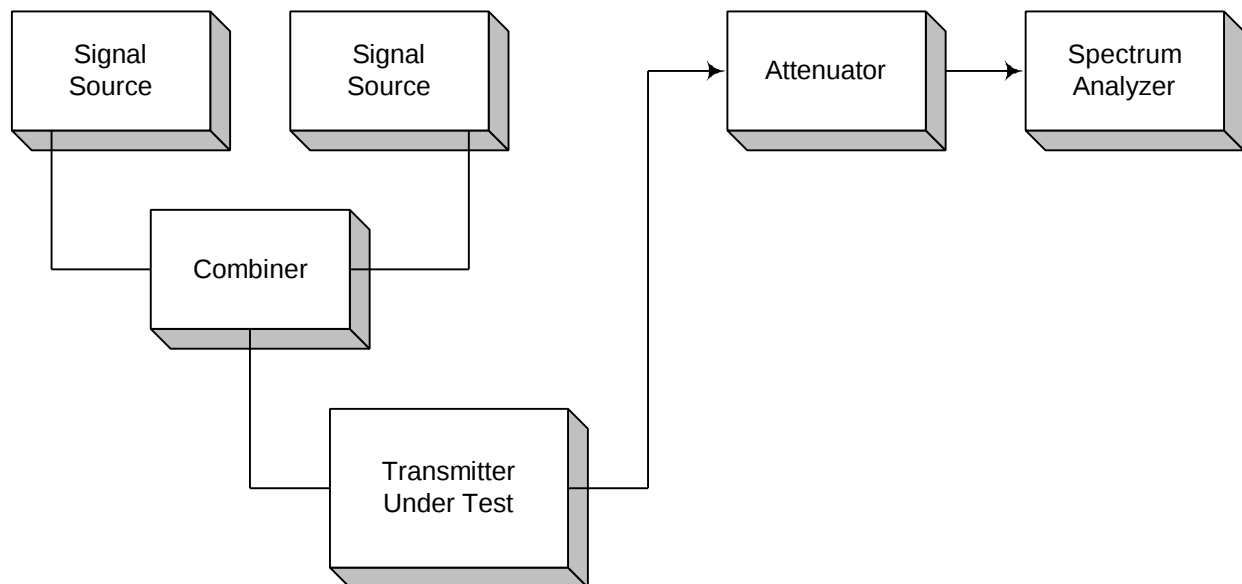
PROJECT NO.: **1L0388RUS2**

ANNEX B - TEST DIAGRAMS

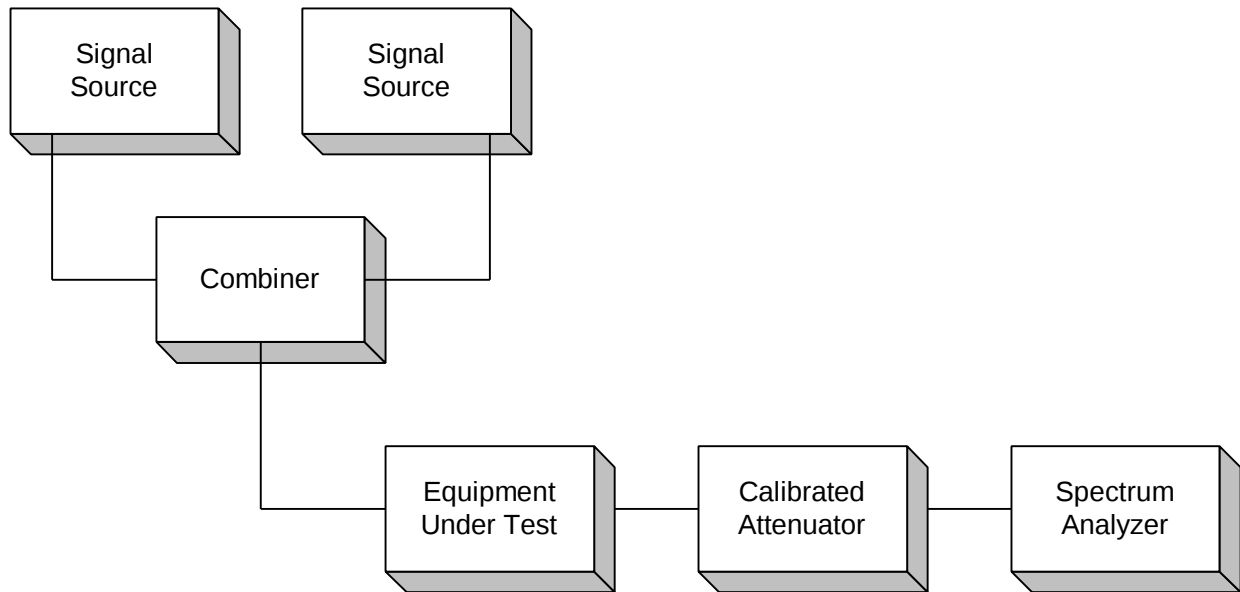
Para. No. 2.985 - R.F. Power Output



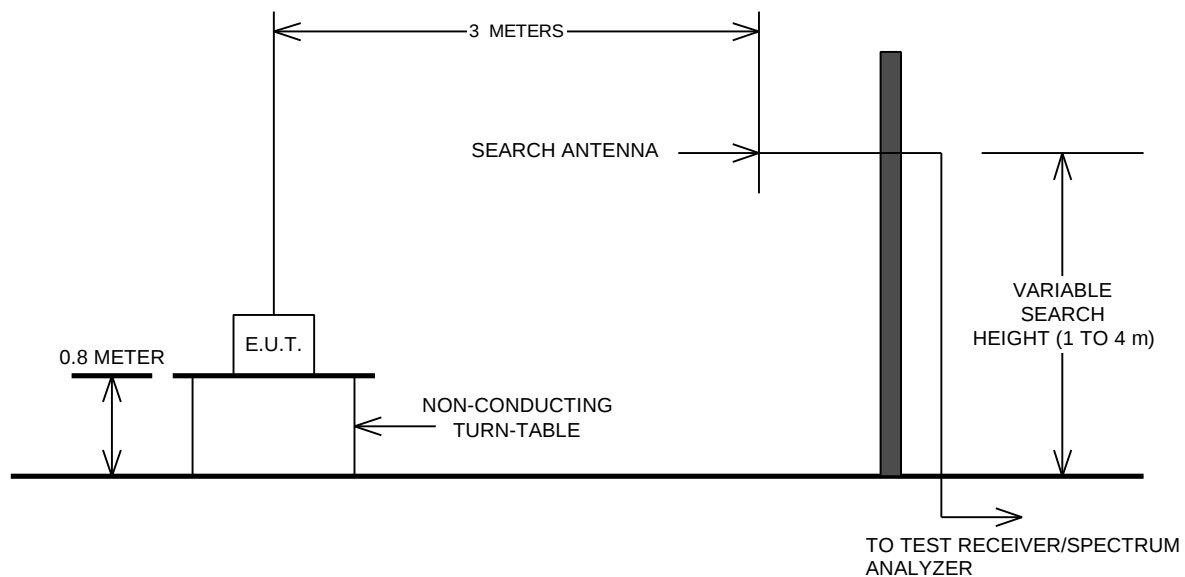
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

