Nemko Test Report:	2L0585RUS1
Applicant:	Coverage Solutions Corporation
Equipment Under Test: (E.U.T.)	BDA-SMR-1/1W-60-A
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:	12/17/02
Total Number of Pages:	57

Table of Contents

Section 1. Summary of Test Results 3

Section 2. General Equipment Specification 5

Section 3. RF Power Output 7

Section 4. Occupied Bandwidth 8

Section 5. Spurious Emissions at Antenna Terminals 21

Section 6. Field Strength of Spurious Emissions 44

Section 7. Test Equipment List 47

ANNEX A - TEST METHODOLOGIES 48

ANNEX B - TEST DIAGRAMS 54

Section 1. Summary of Test Results

Manufacturer: Coverage Solutions Corp.

Model No.: BDA-SMR-1/1W-60-A

Serial No.: 02091158

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

A	M	P

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. None

Nemko Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

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	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A
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	N/A
Transient Frequency Behavior	90.214	N/A

Footnotes For N/A's:

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

.

Section 2. General Equipment Specification

Transmitter

Supply Voltage Input:		115 Vac
Frequency Range:	**Uplink**	806-821 MHz
	Downlink	851-866 MHz

Type(s) of Modulation:

F3E	F1D	F2D (FSK)	D7W (QAM)	Other
☐	☐	☒	☒	☐

Gain:		60 dB
Output Impedance:		50 ohms
RF Power Output (rated):	**Single:**	2 watts
	Composite:	2 watts
Channel Spacing(s):		Full band coverage
Operator Selection of Operating Frequency:		Full band coverage
Power Output Adjustment Capability:		Manual

Frequency Translation:

F1-F1	F1-F2	N/A
☒	☐	☐

Band Selection:

Software	Duplexer Change	Fullband Coverage
☐	☐	☒

Theory of Operation

The BDA downlink path receives RF signals from the base station and amplifies and transmits them to the subscriber. The BDA uplink path receives RF signals from the subscriber and amplifies and transmits them to the base station.

A selectable Automatic Level Control (ALC) allows for output power limiting. A variable step attenuator gives 0-30 dB of attenuation in 2 dB steps.

System Diagram

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 12/12/2002

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Measured Power (dBm)	Measured Power (Watts)
813.5	32	1.6
858.5	32	1.6

Test Equipment Used: 1036-1064-1064-1083

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 12/12/2002

Test Results: Complies.

Test Data: See attached graph(s).

Test Data – Occupied Bandwidth

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

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 1 of 6 Complete X

Job No.: 2L0584R Date: 12/12/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: Lance Walker Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

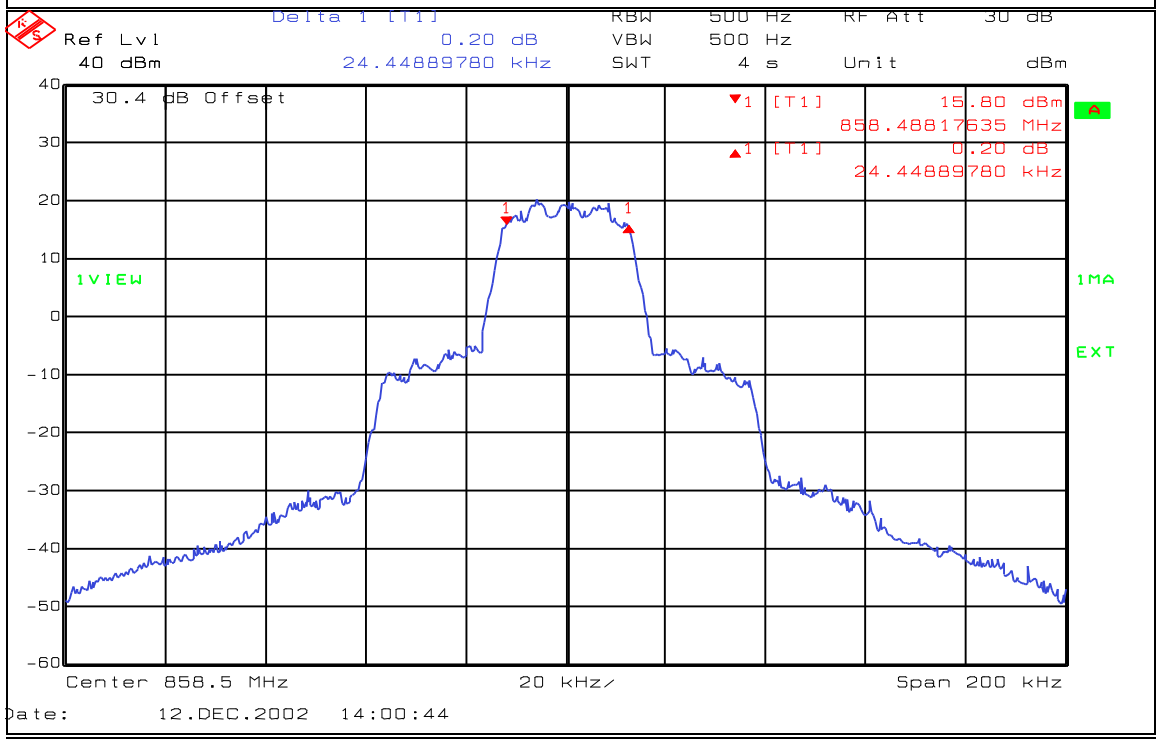
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM OUTPUT**
DOWNLINK

Test Data – Occupied Bandwidth

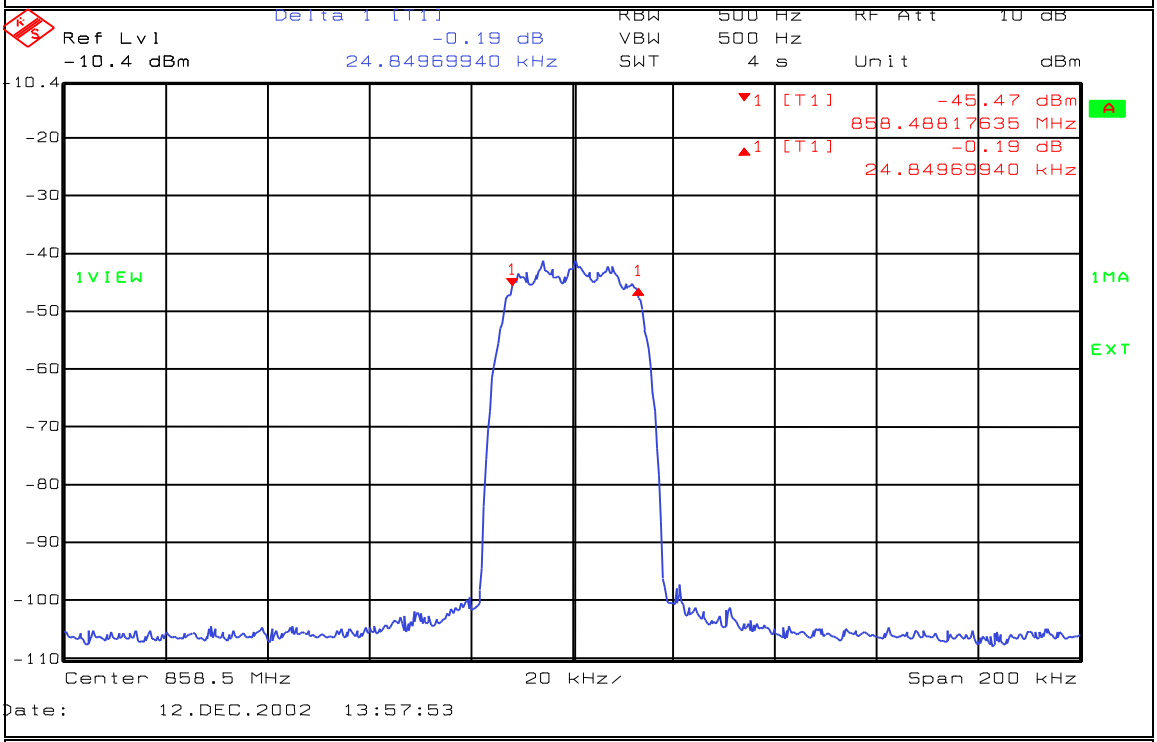
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 2 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM INPUT**
DOWNLINK

Test Data – Occupied Bandwidth

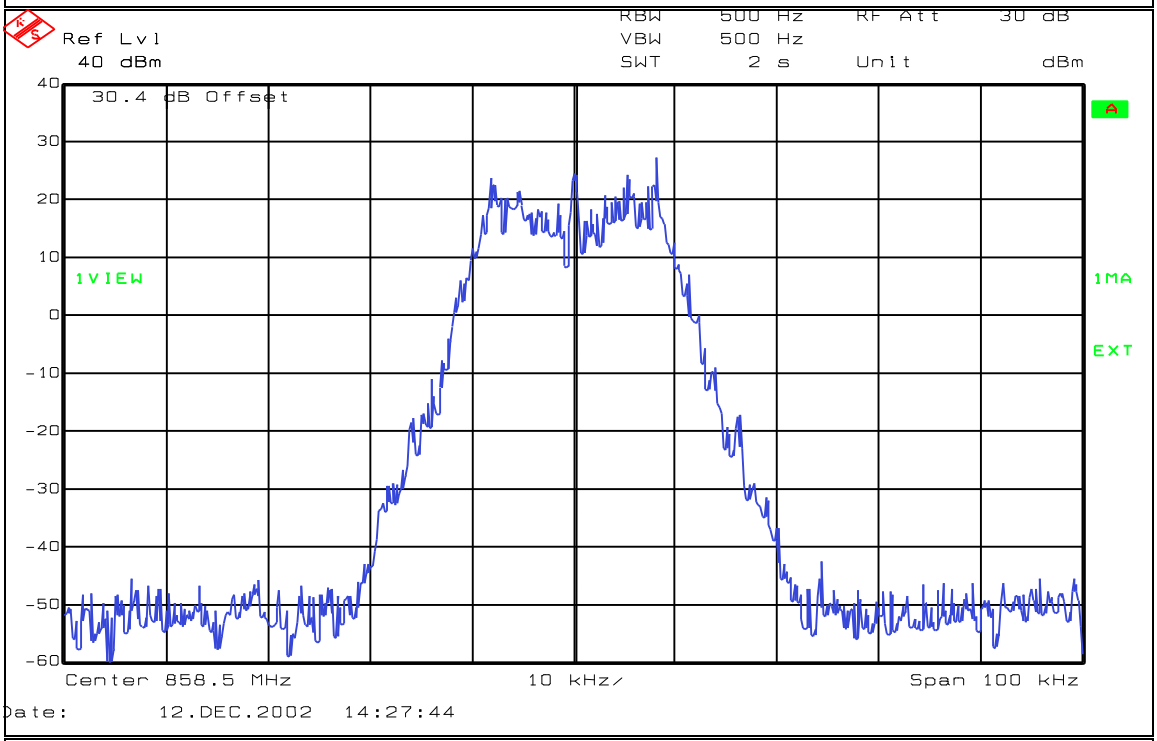
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 3 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK OUTPUT**
DOWNLINK

Test Data – Occupied Bandwidth

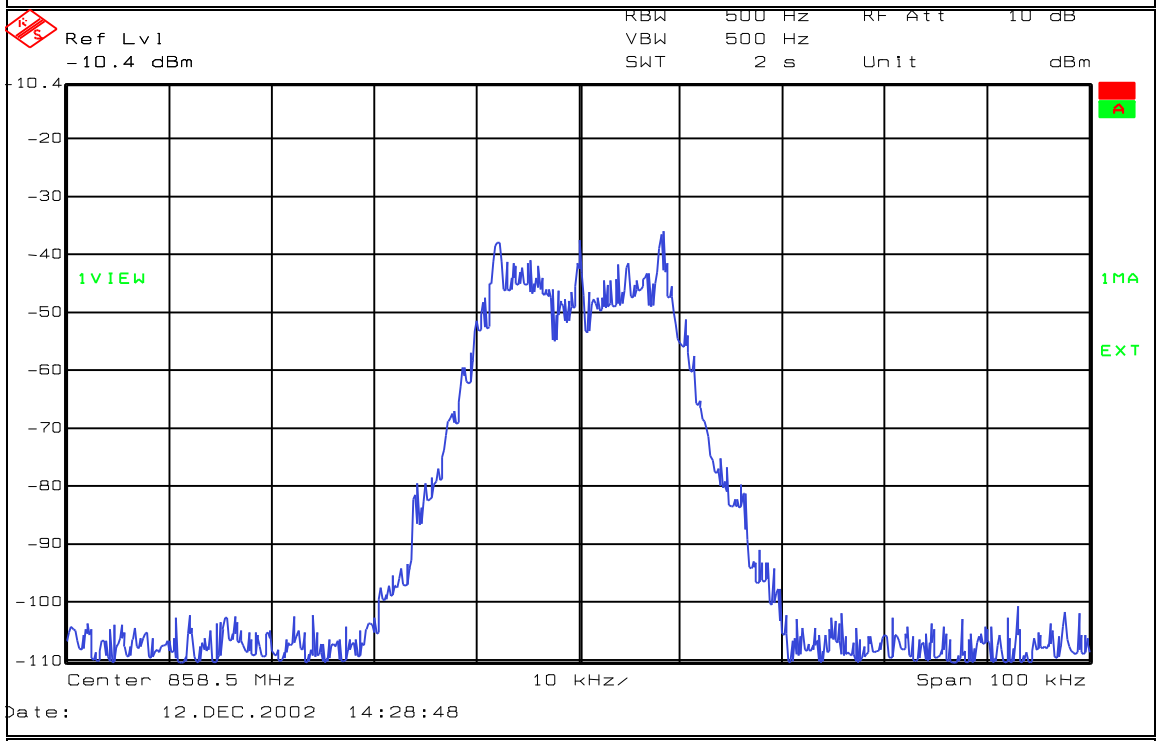
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 4 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK INPUT**
DOWNLINK

Test Data – Occupied Bandwidth

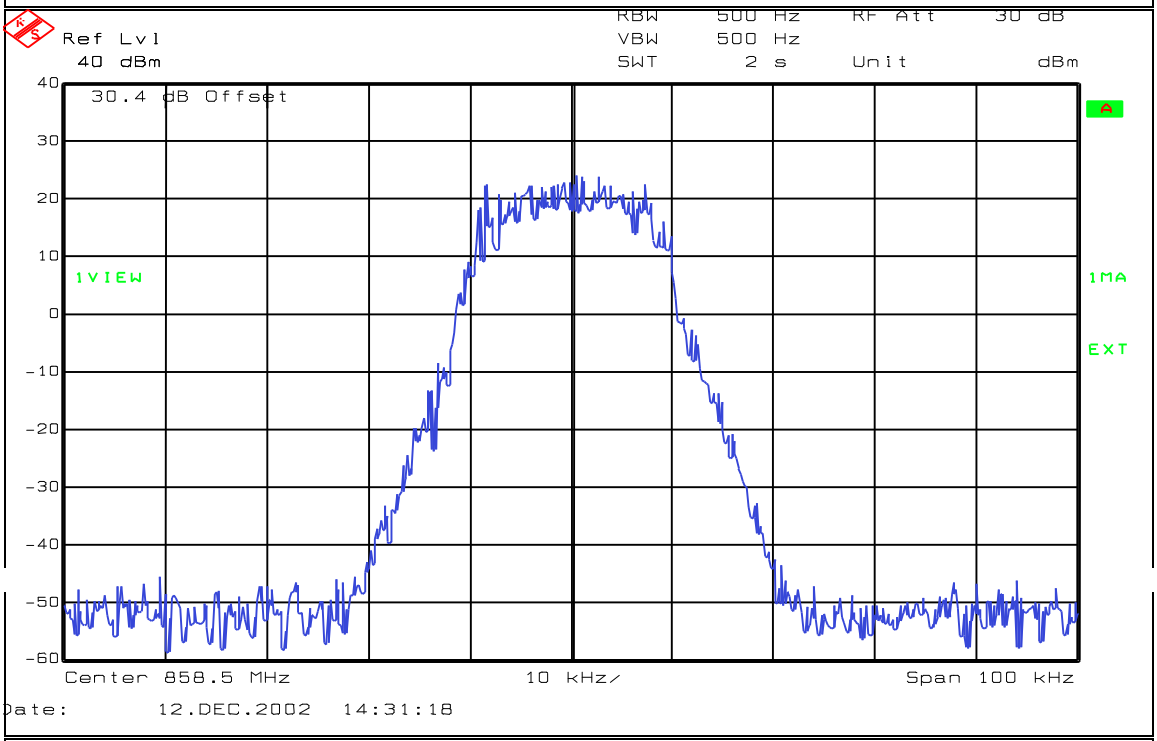
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 5 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK OUTPUT**
DOWNLINK

Test Data – Occupied Bandwidth

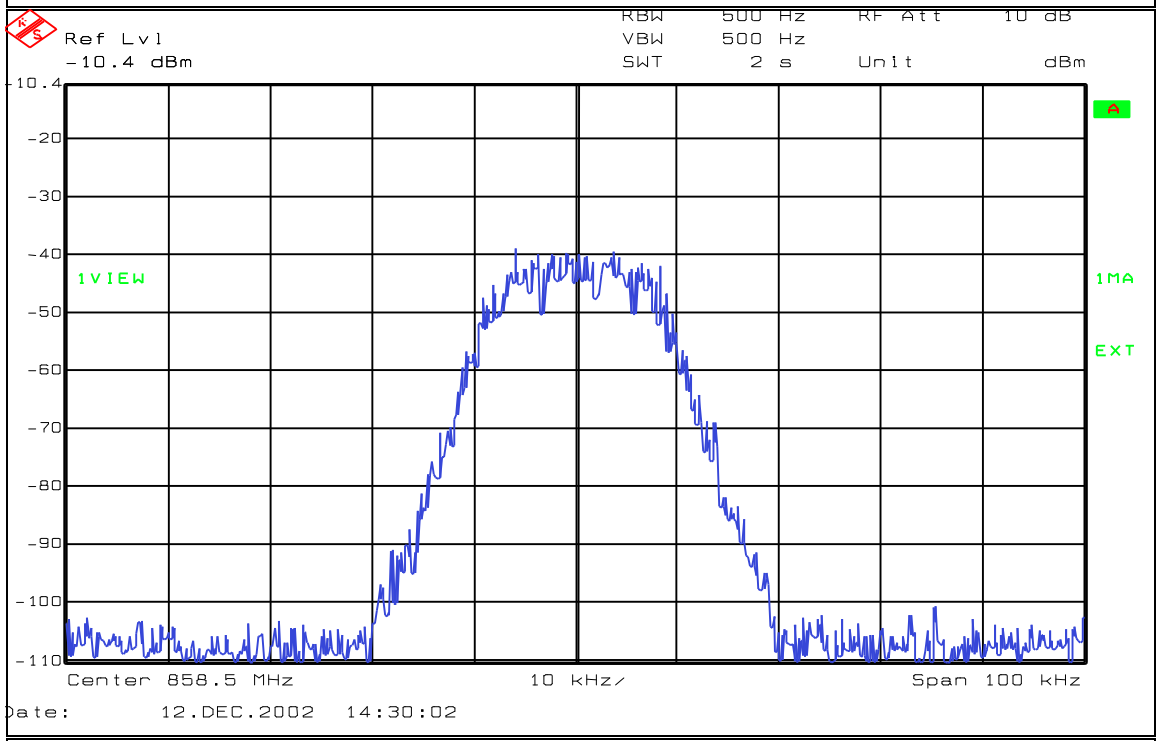
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 6 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK INPUT**
DOWNLINK

Test Data – Occupied Bandwidth

Nemko Dallas, Inc.

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

Data Plot **Intermodulation Characteristics**

Page 1 of 6 Complete X

Job No.: 2L0584R Date: 12/12/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: Lance Walker Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

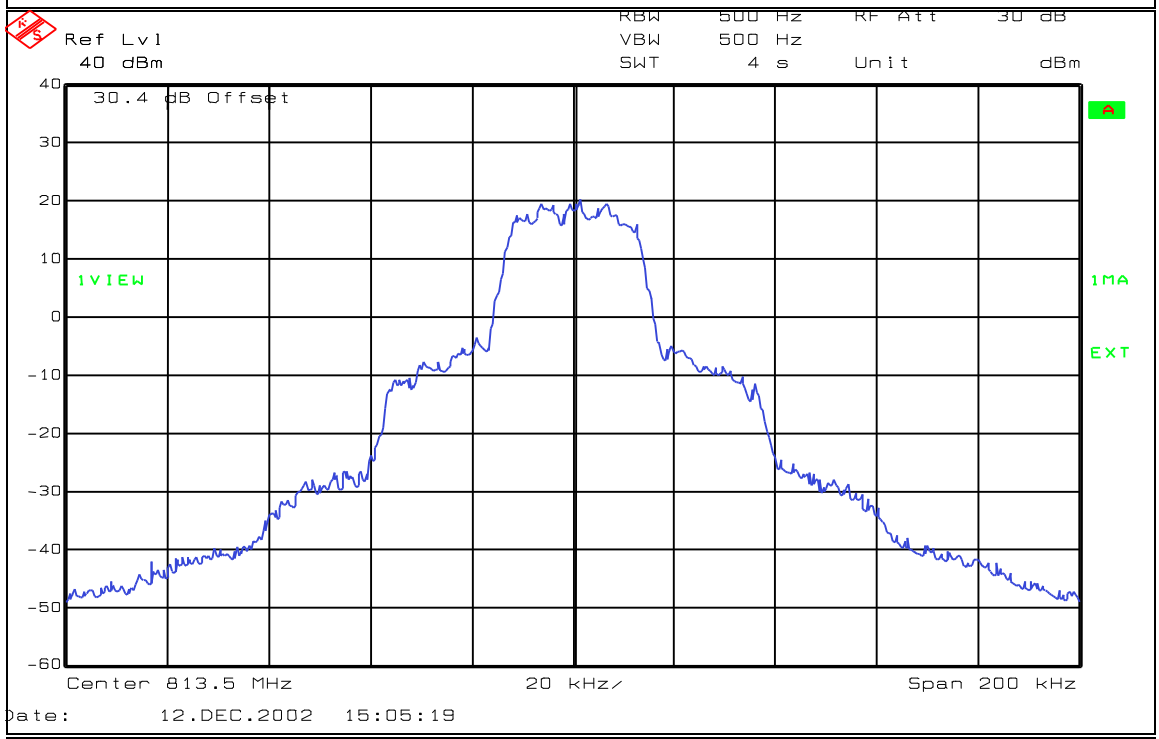
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM OUTPUT**
UPLINK

Test Data – Occupied Bandwidth

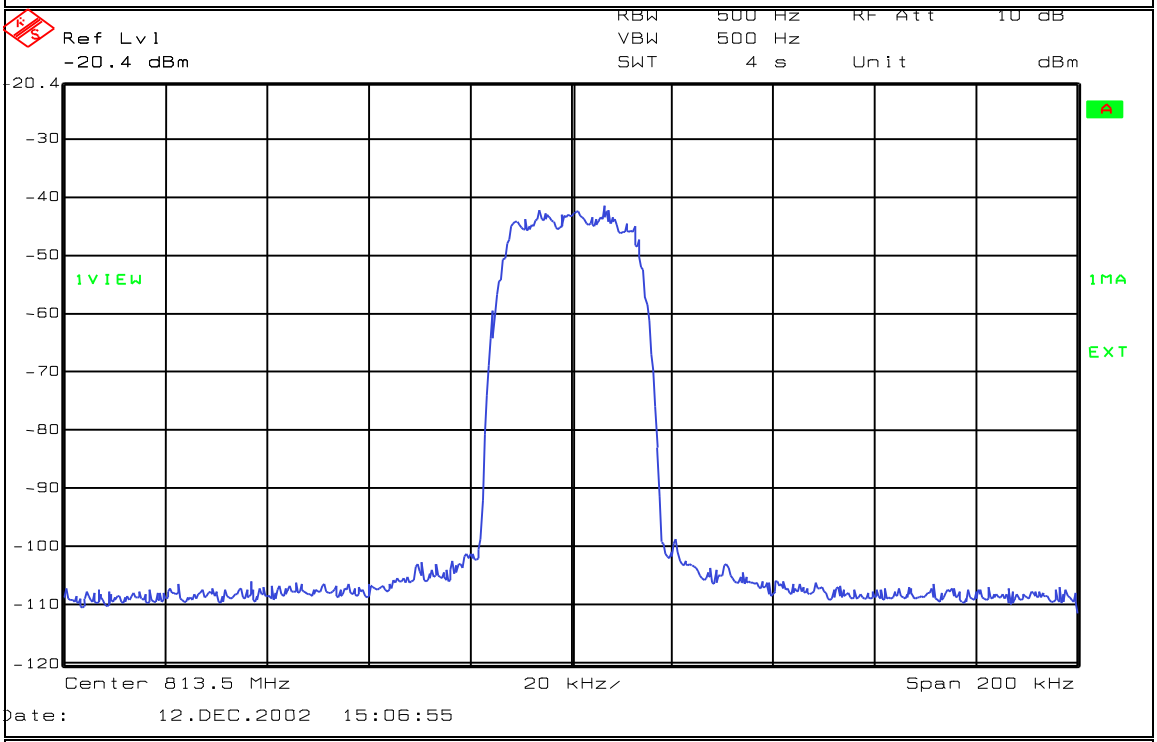
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 2 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM INPUT**
UPLINK

Test Data – Occupied Bandwidth

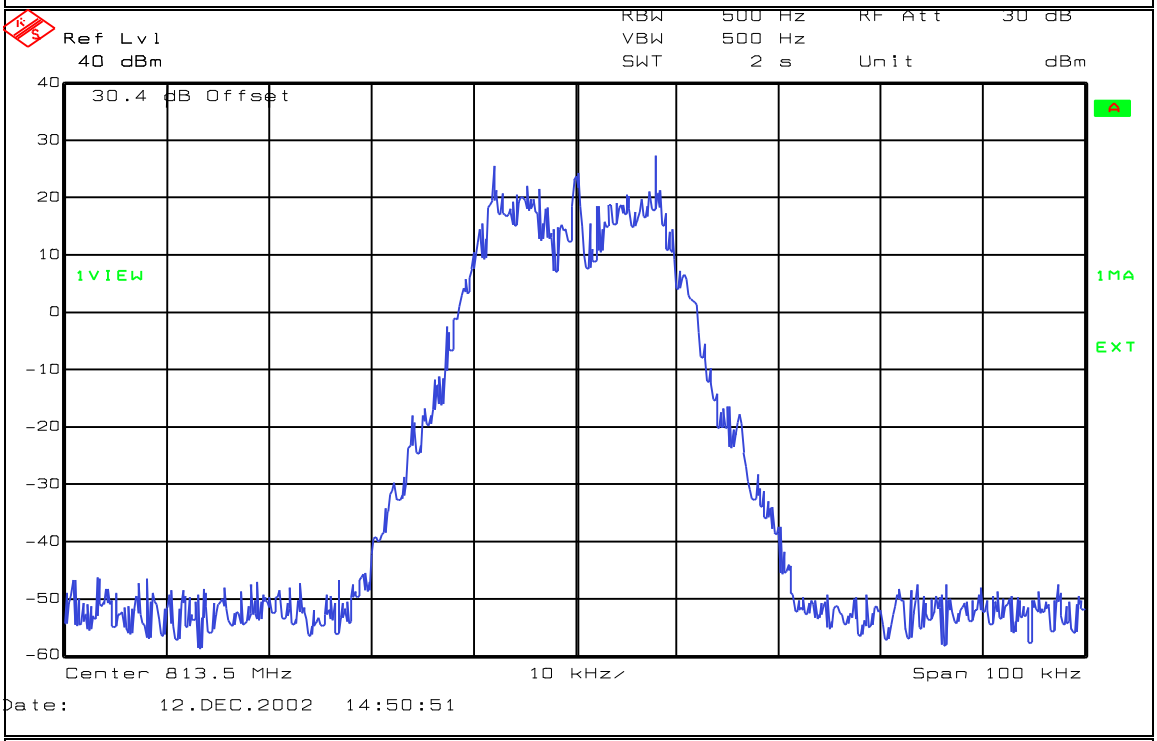
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 3 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK OUTPUT**
UPLINK

Test Data – Occupied Bandwidth

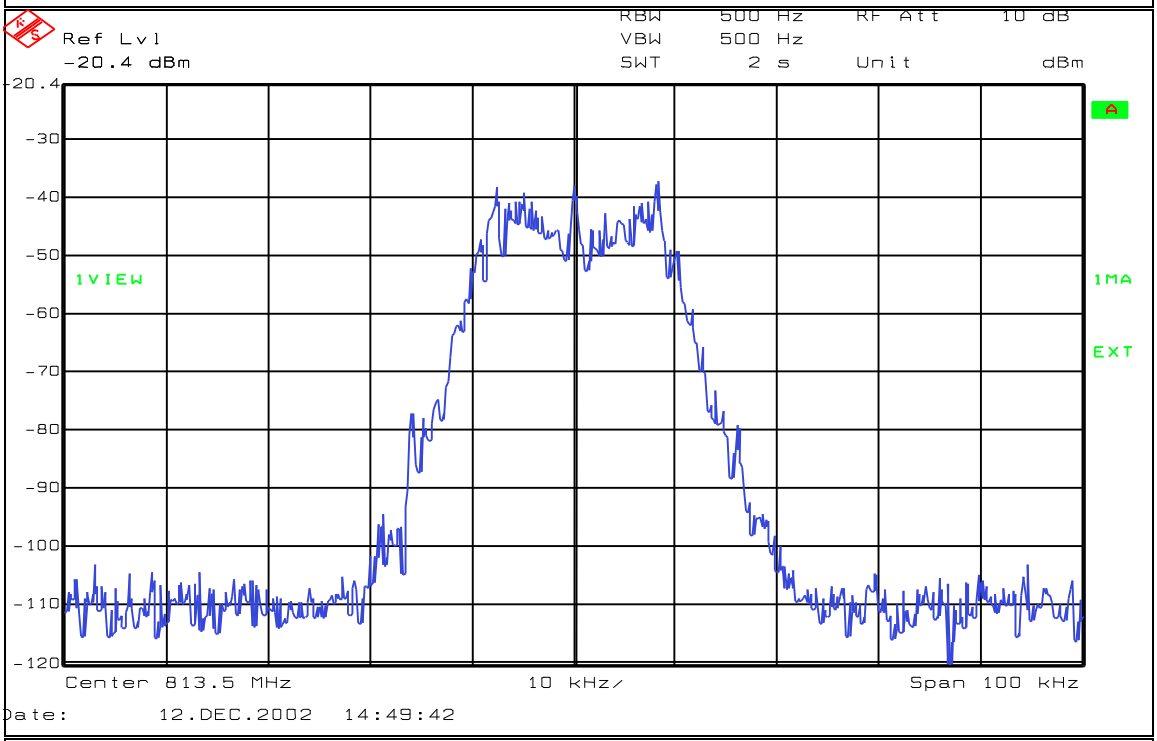
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 4 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK INPUT**
UPLINK

Test Data – Occupied Bandwidth

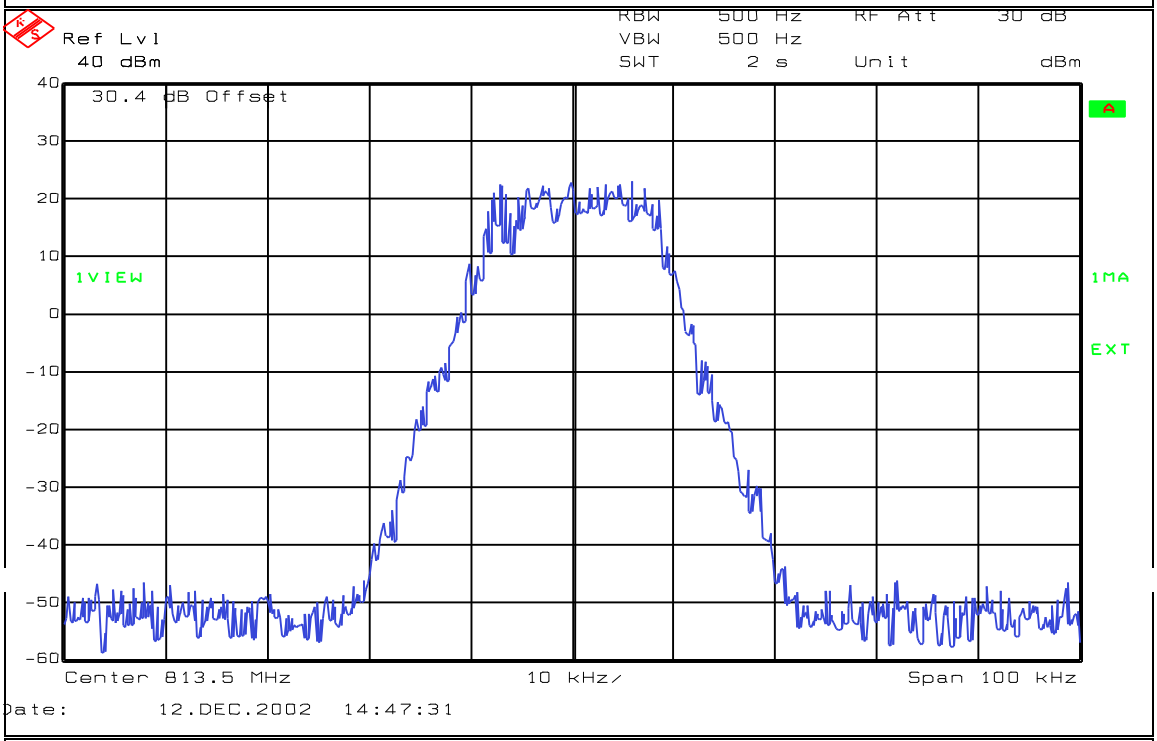
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 5 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK OUTPUT**
UPLINK

Test Data – Occupied Bandwidth

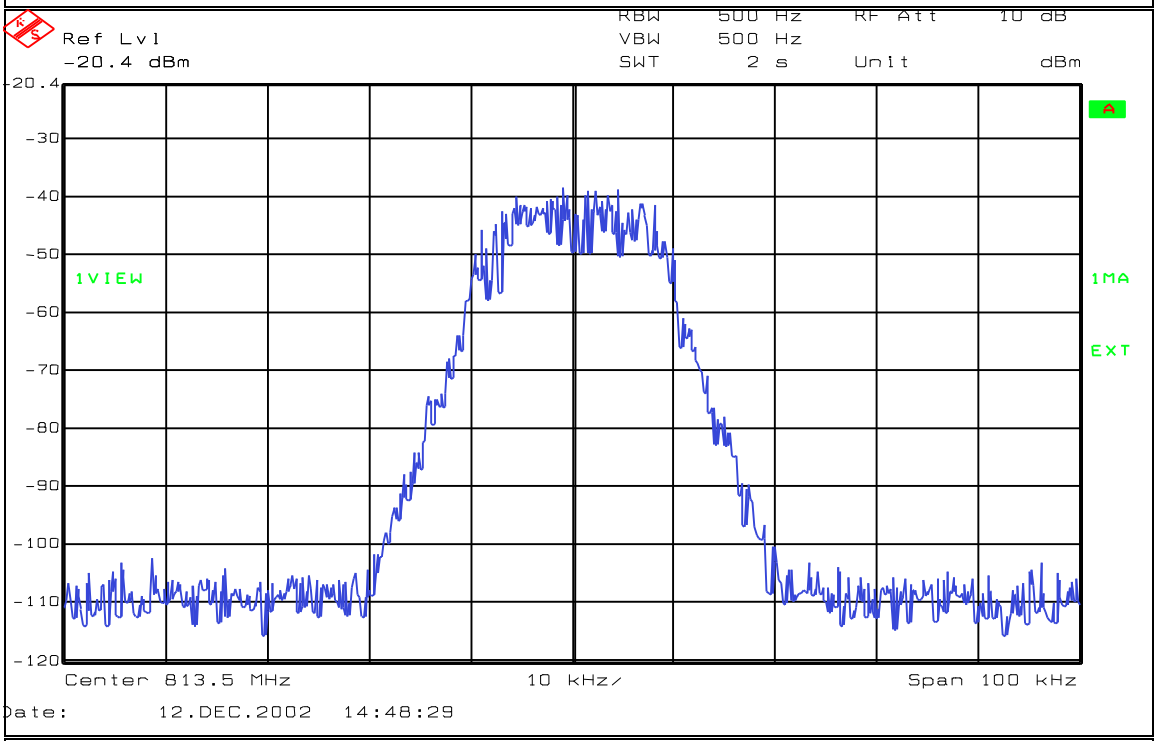
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 6 of 6

Job No.:	2L0584R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK INPUT**
UPLINK

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 12/13/2002

Test Results: Complies.

Test Data: See attached graph(s).

Test Data – Spurious Emissions at Antenna Terminals

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 6 Complete X

Job No.: 2L0586R Date: 12/12/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

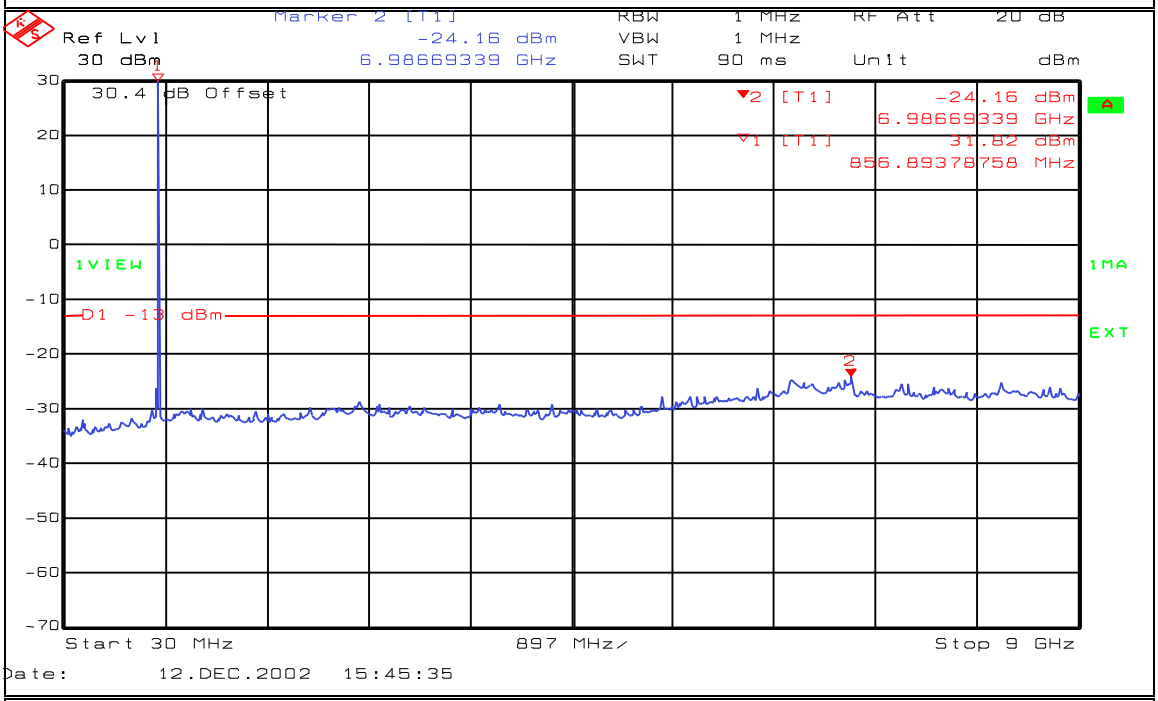
Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1083
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1064	Cable #4:	
Attenuator #2:	1065	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
DOWNLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

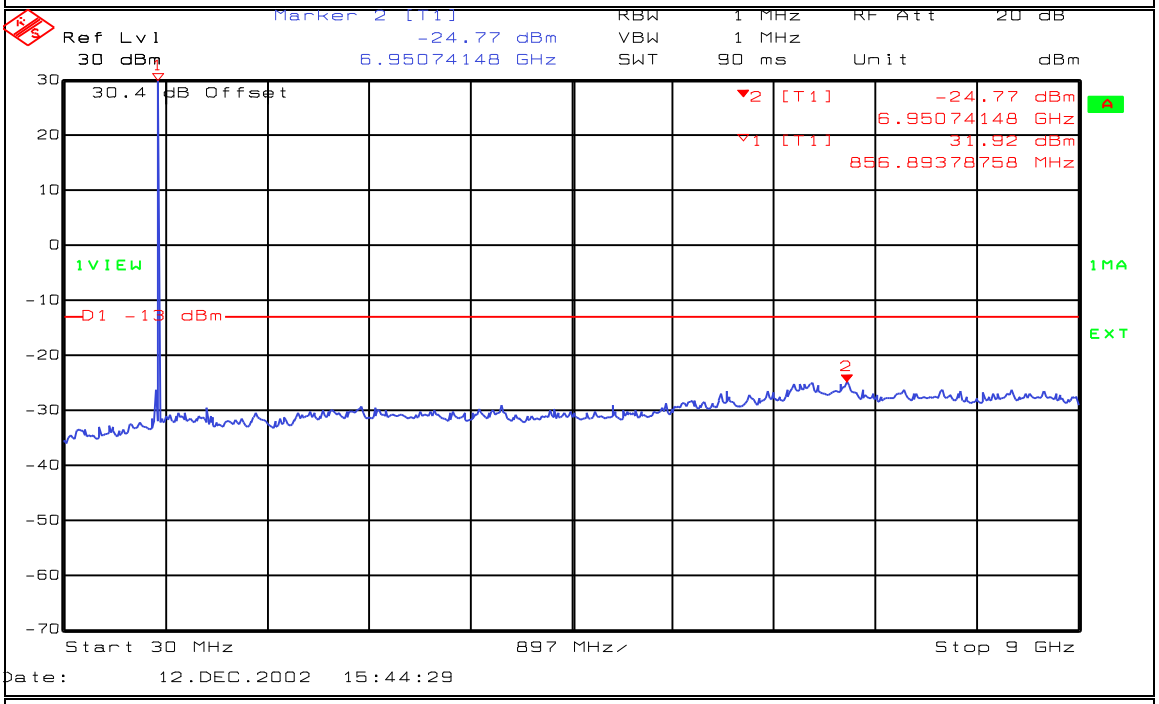
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 2 of 6

Job No.:	2L0586R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK**
DOWNLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

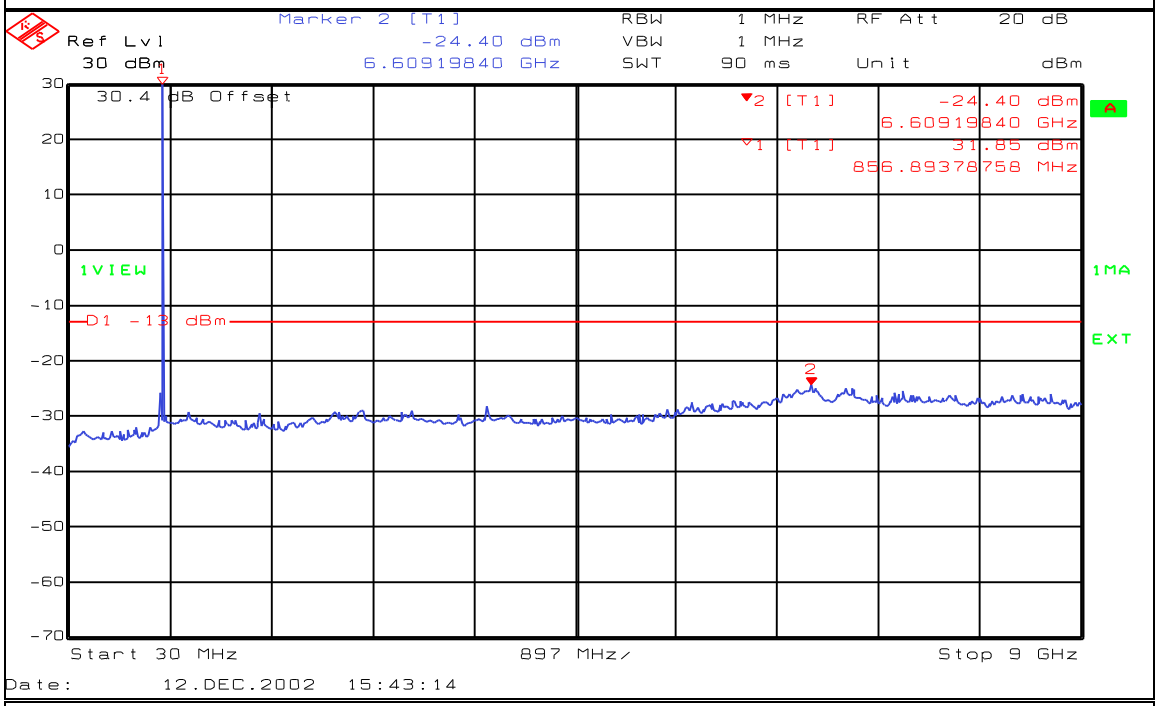
Nemko Dallas, Inc.

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

Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 6

Job No.:	2L0586R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK OUTPUT**
DOWNLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

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 6 Complete X

Job No.: 2L0586R Date: 12/12/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

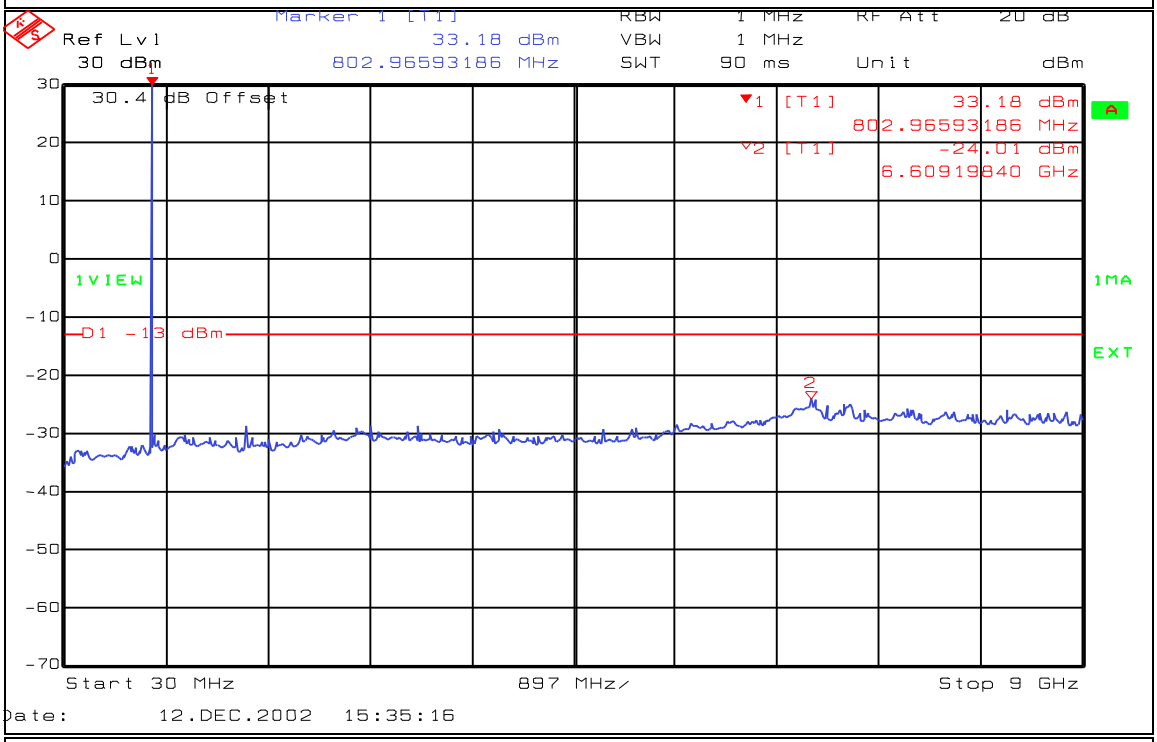
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
UPLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

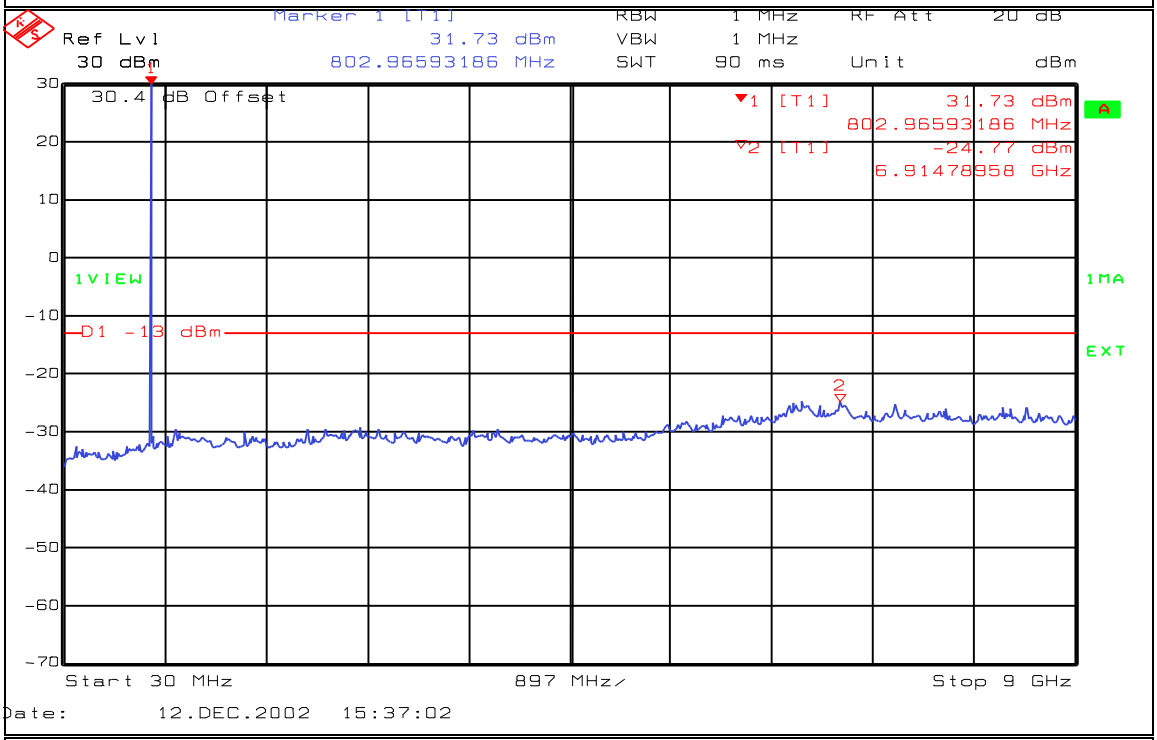
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 2 of 6

Job No.:	2L0586R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **2FSK**
UPLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

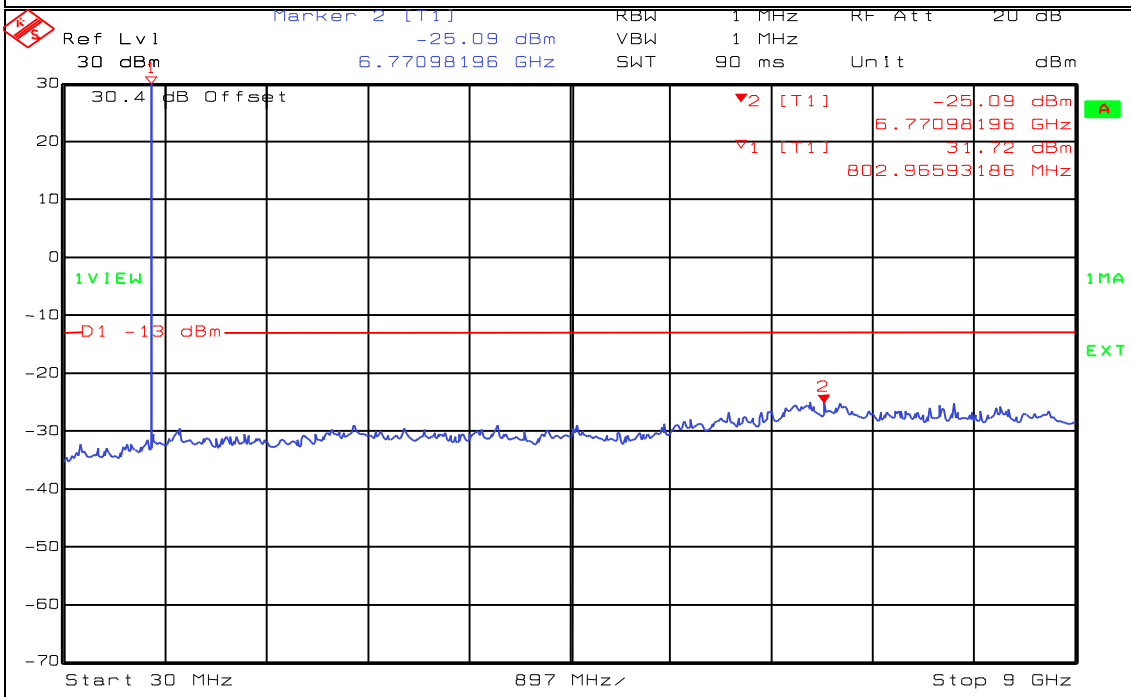
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 6

Job No.:	2L0586R	Date:	12/12/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **4FSK OUTPUT**
UPLINK
MARKER 1 INDICATES CARRIER-MARKER 2 INDICATES HIGHEST EMISSION LEVEL

Test Data – Spurious Emissions at Antenna Terminals

Nemko

Nemko Dallas, Inc.

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

Data Plot **Bandedges**

Page 1 of 4 Complete X

Job No.: 2L0584R Date: 12/13/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

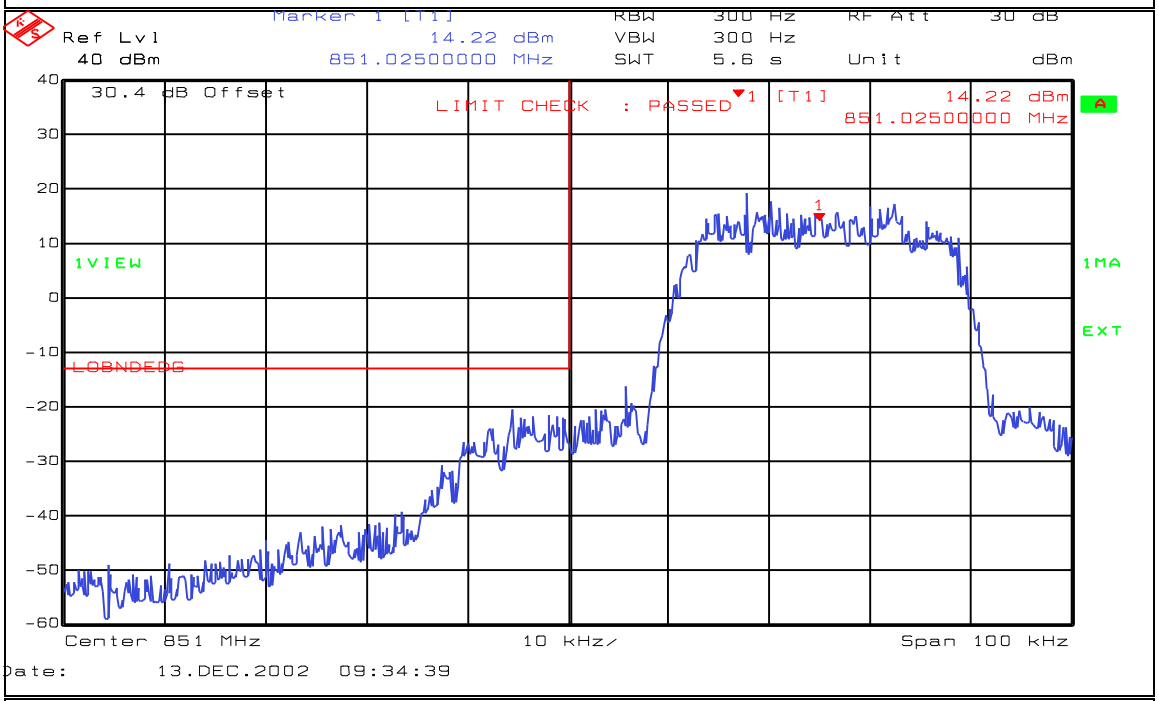
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko

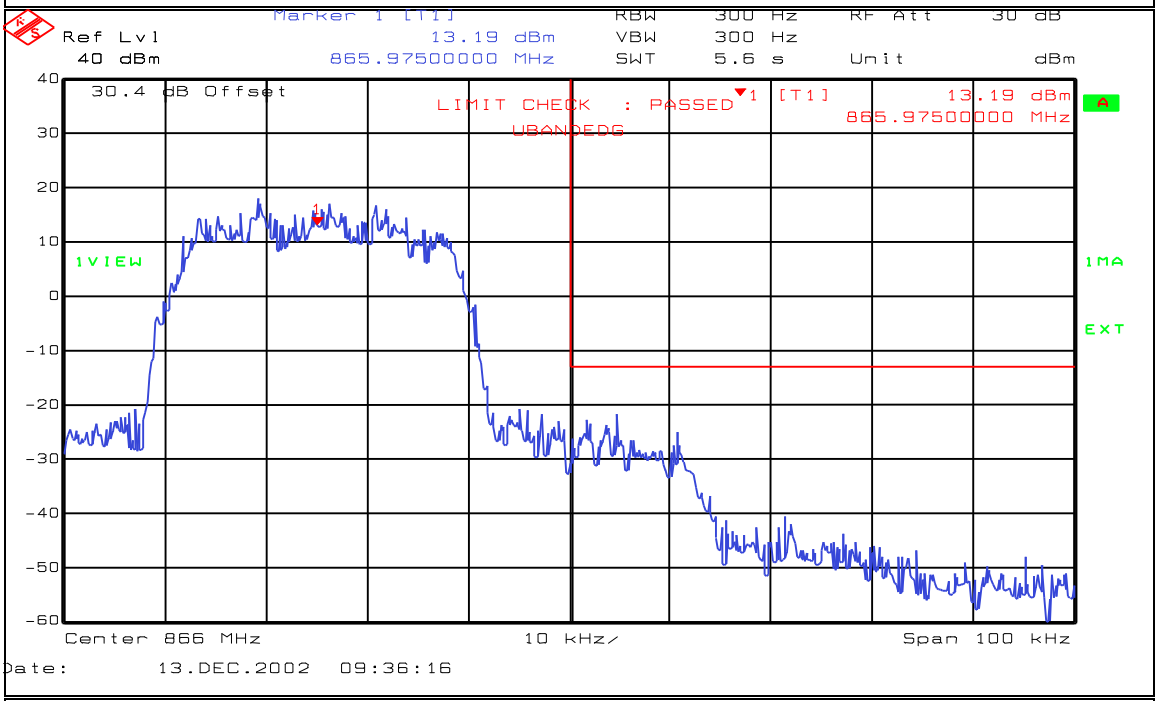
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Bandedges**

Page 2 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

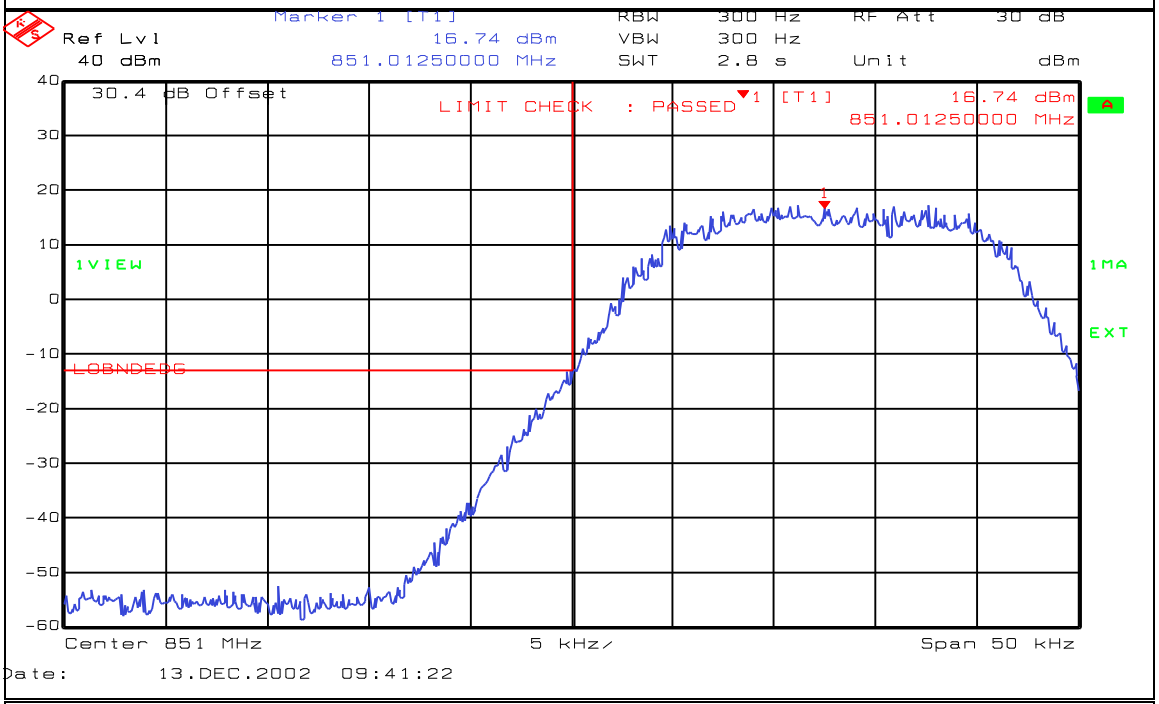
Nemko Dallas, Inc.

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

Data Plot **Bandedges**

Page 3 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **FSK**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

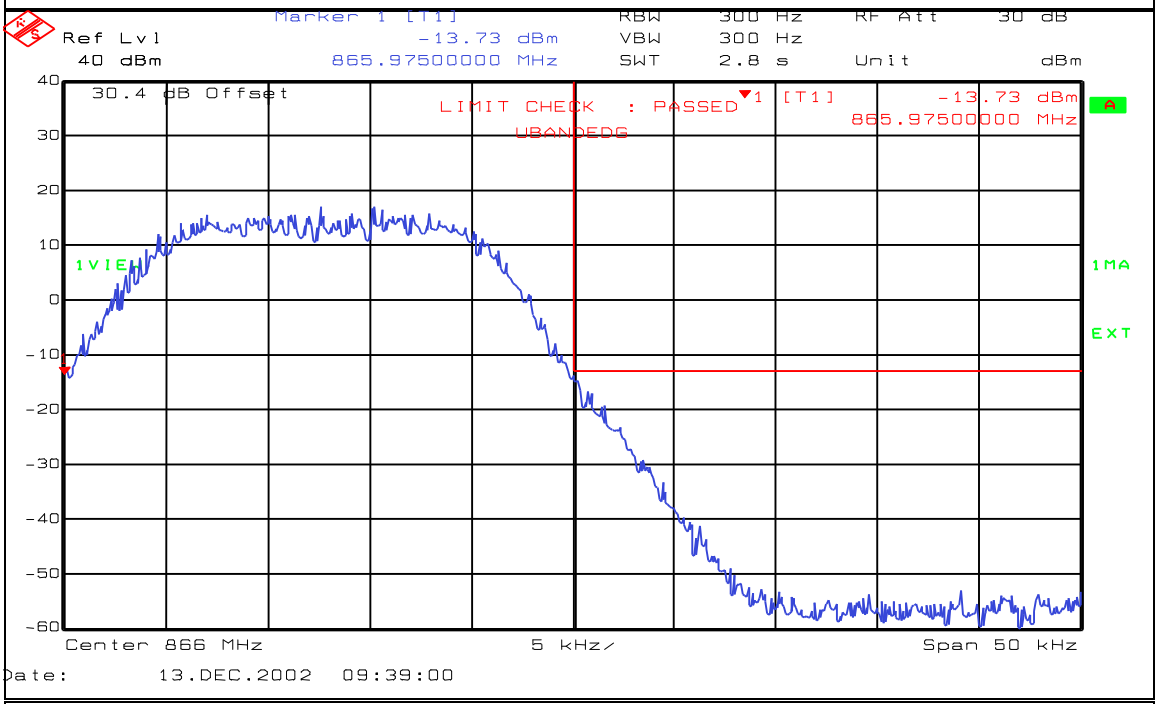
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Bandedges**

Page 4 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **FSK**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko Dallas, Inc.

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

Data Plot **Bandedges**

Page 1 of 4 Complete X

Job No.: 2L0584R Date: 12/13/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

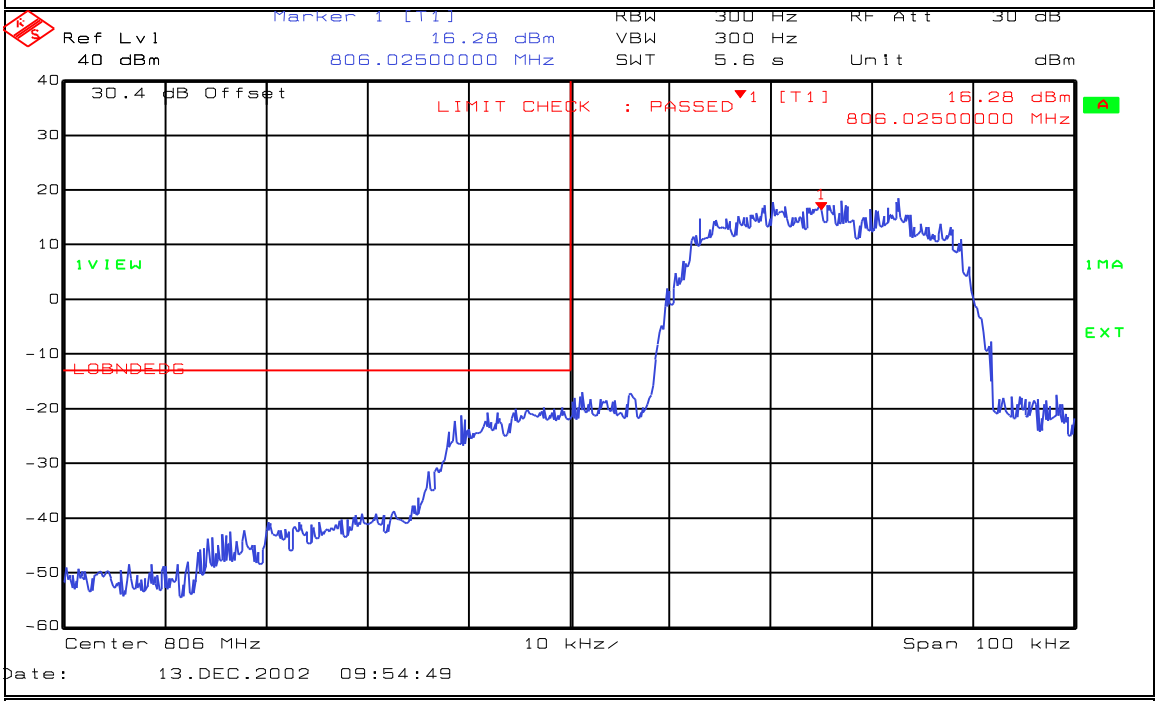
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko

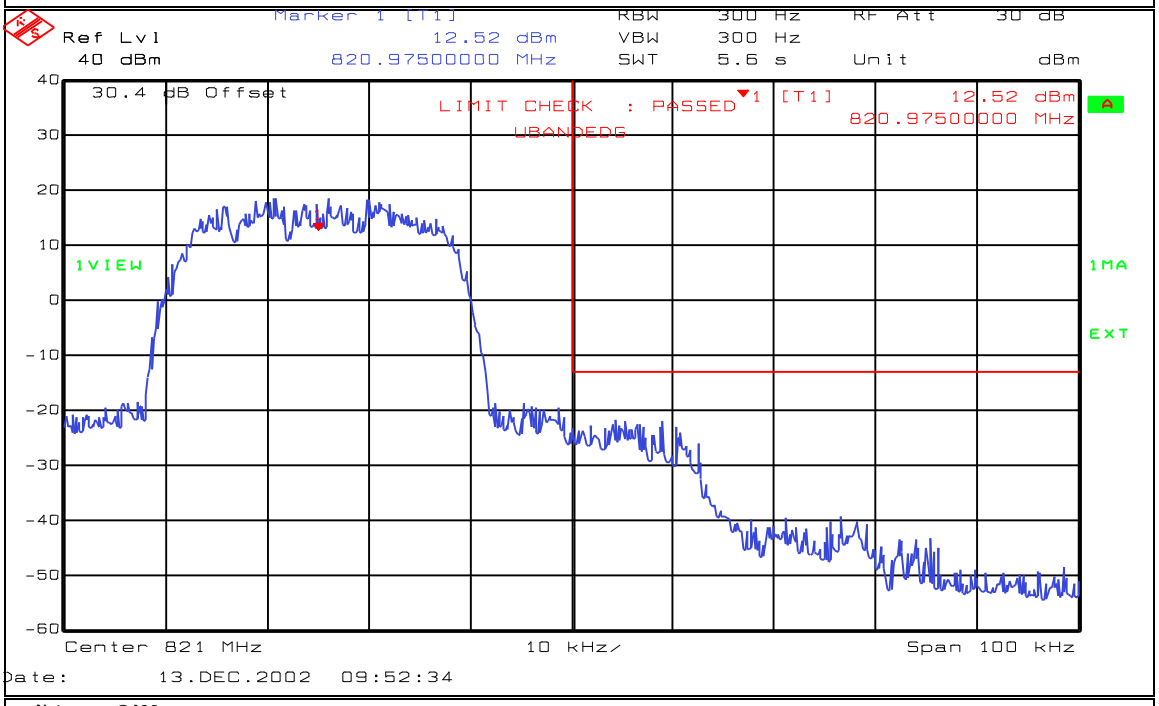
Nemko Dallas, Inc.

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

Data Plot **Bandedges**

Page 2 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

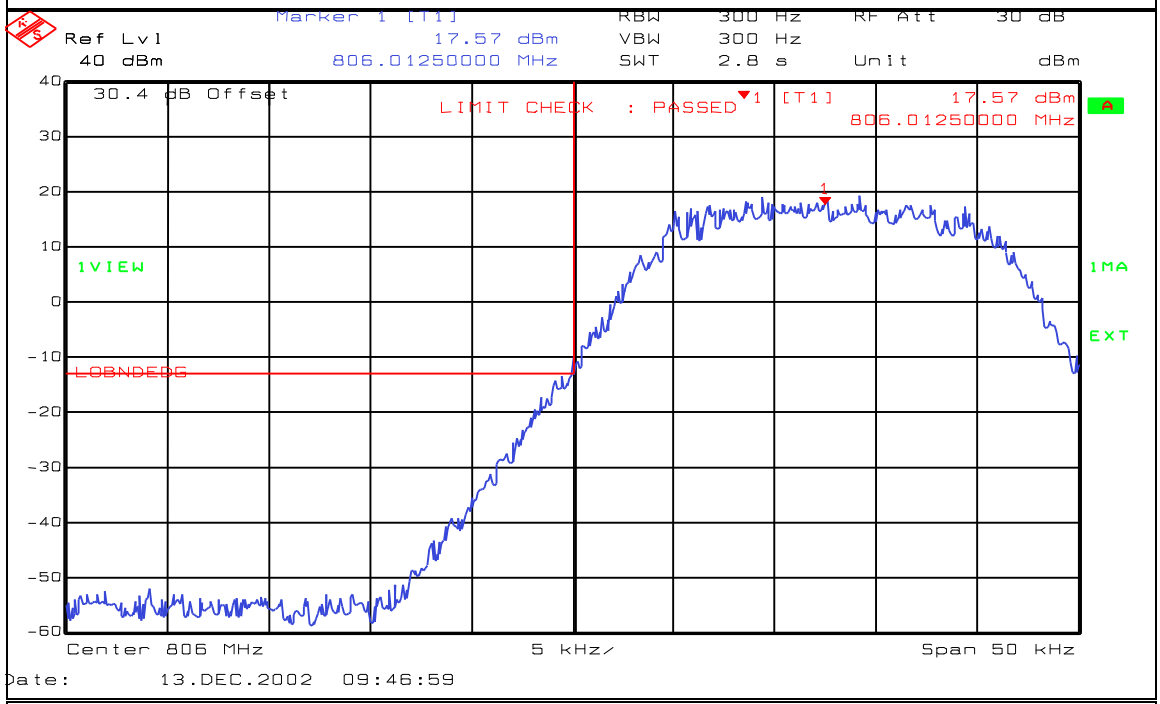
Nemko Dallas, Inc.

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

Data Plot **Bandedges**

Page 3 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **FSK**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko

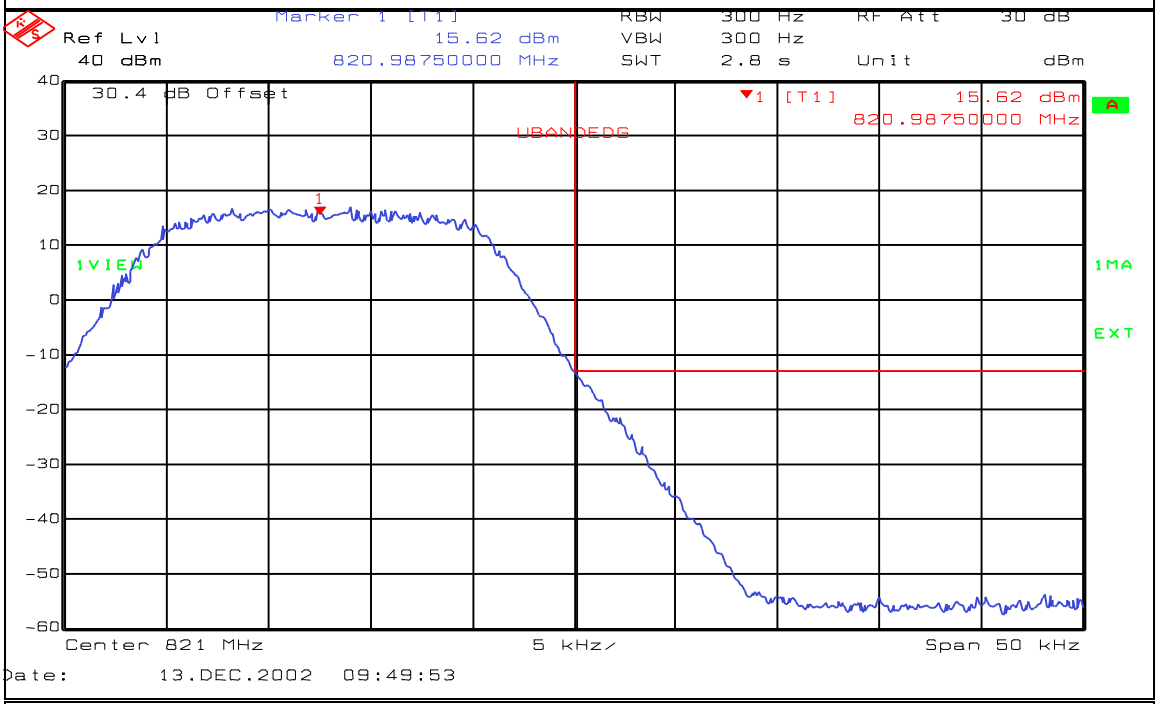
Nemko Dallas, Inc.

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

Test Plot: **Bandedges**

Page 4 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **FSK**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko Dallas, Inc.

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

Data Plot **Intermodulation Characteristics**

Page 1 of 4 Complete X

Job No.: 2L0584R Date: 12/13/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

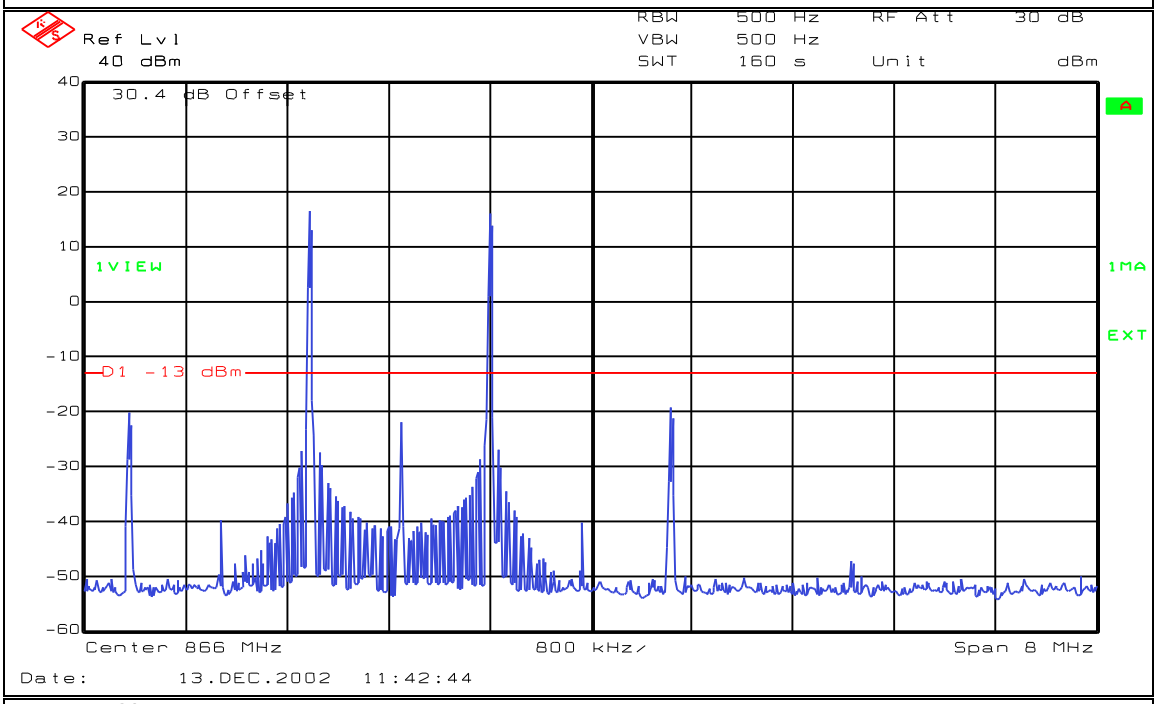
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

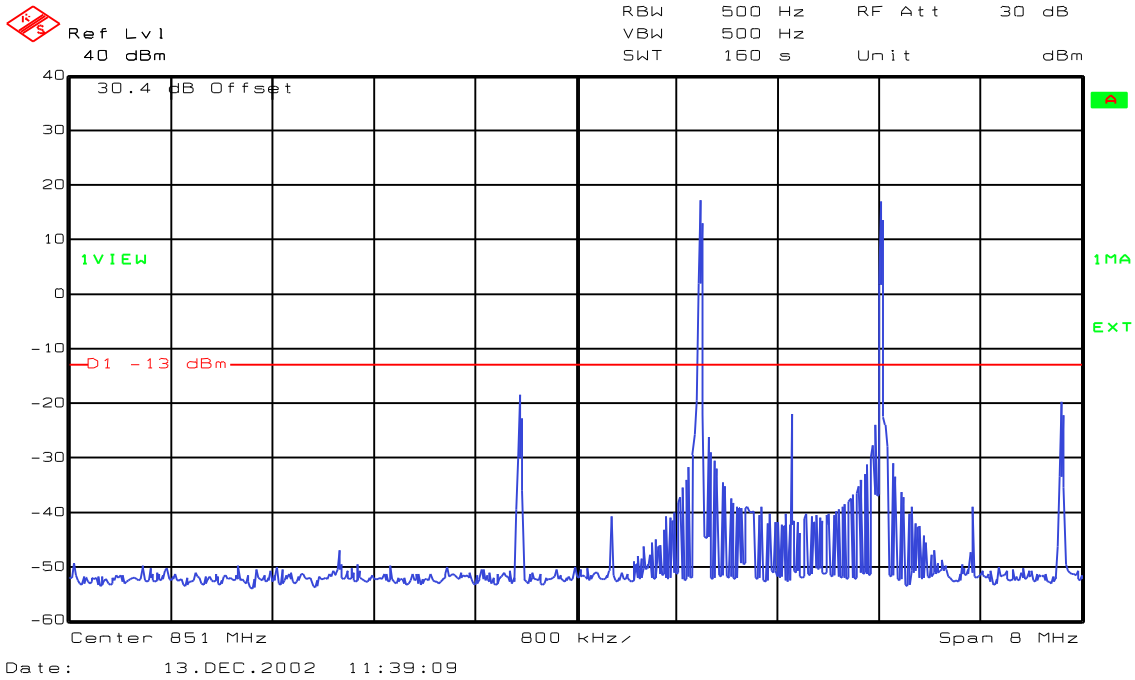
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 2 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

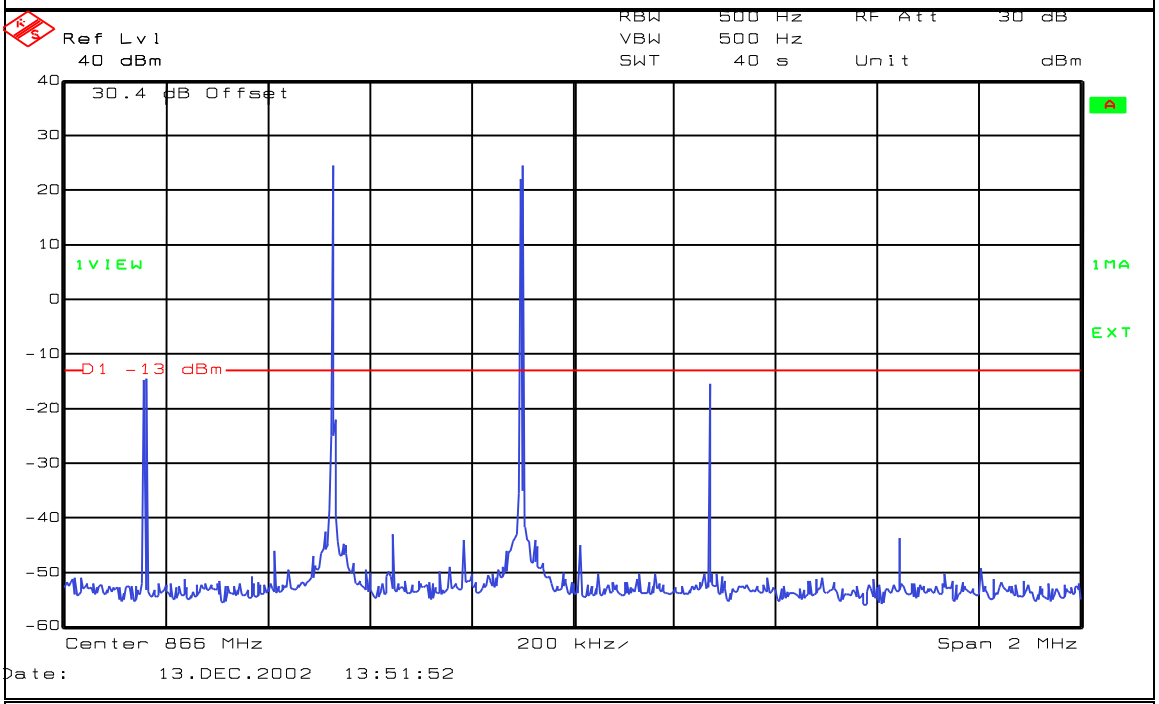
Nemko Dallas, Inc.

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

Data Plot **Intermodulation Characteristics**

Page 3 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **ANALOG**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

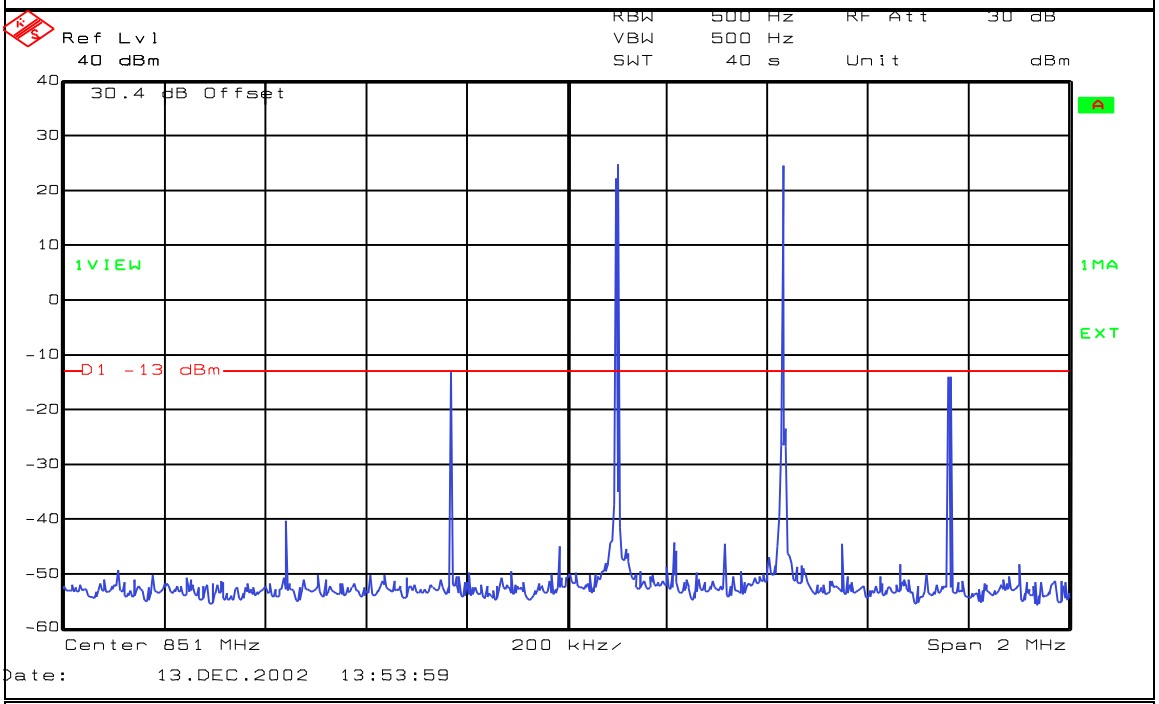
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 4 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **ANALOG**
DOWNLINK

Test Data – Spurious Emissions at Antenna Terminals

Nemko

Nemko Dallas, Inc.

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

Data Plot **Intermodulation Characteristics**

Page 1 of 4 Complete X

Job No.: 2L0584R Date: 12/13/2002 Preliminary:

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: TX FULL POWER

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

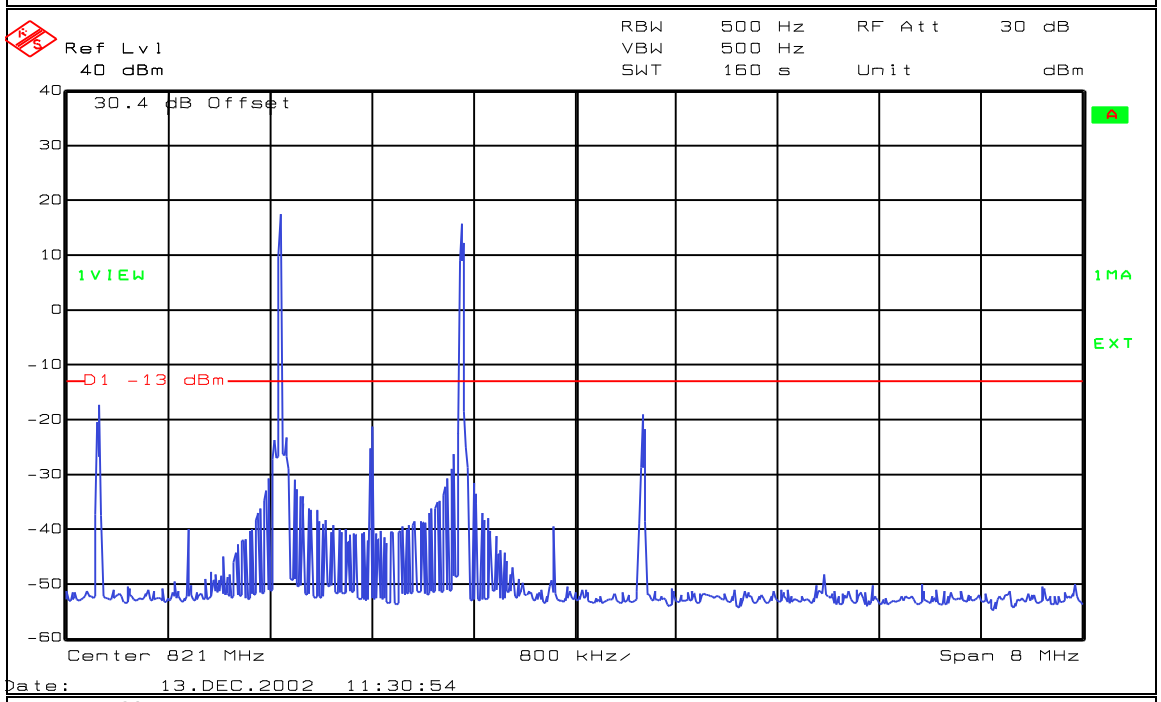
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: 1065 Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **QAM**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

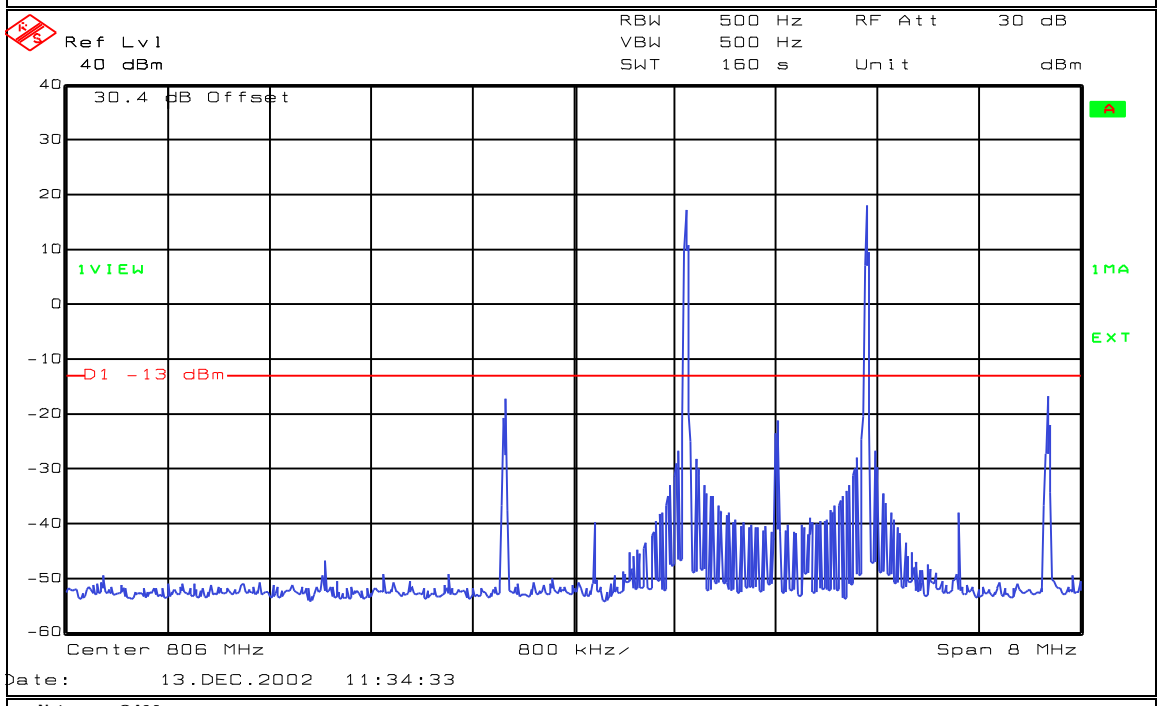
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 2 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **QAM**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

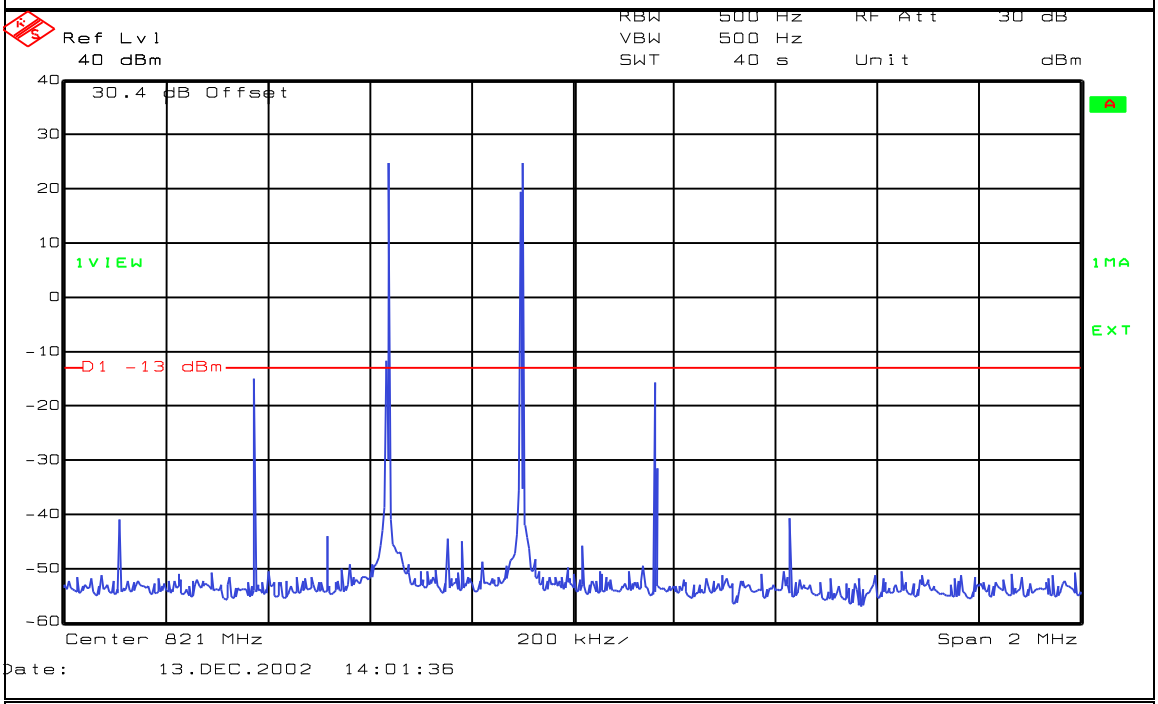
Nemko Dallas, Inc.

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

Data Plot **Intermodulation Characteristics**

Page 3 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **ANALOG**
UPLINK

Test Data – Spurious Emissions at Antenna Terminals

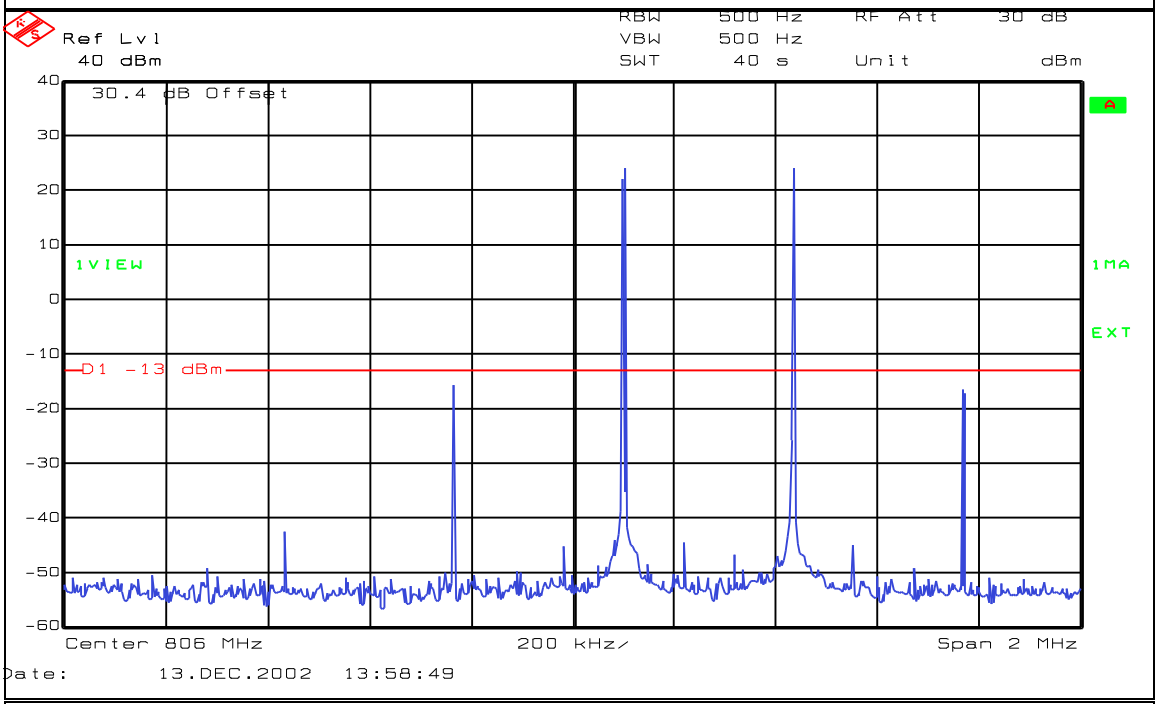
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **Intermodulation Characteristics**

Page 4 of 4

Job No.:	2L0584R	Date:	12/13/2002
Specification:	PART90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	60 dB gain SMR repeater		
Configuration:	TX FULL POWER		



Notes: **ANALOG**
UPLINK

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 12/13/2002

Test Results: Complies.

Test Data: See attached table.

Note: See page A5 for applicable limit.

Test Data - Radiated Emissions

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

Nemko Dallas, Inc.

ERP Substitution Method

Page 1 of 1 Complete X

Job No.: 2L0584R Date: 12/13/02 Preliminary

Specification: PART90 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 60 dB gain SMR repeater

Configuration: Tx full power into load

Sample No: 1

Location: AC 3 RBW: 100 kHz Measurement

Detector Type: Peak VBW: 30 kHz Distance: 3 m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: 1016 Cable #1: 1484

Filter: Cable #2: 1485

Receiver: 1464 Cable #3:

Attenuator #1 Cable #4:

Attenuator #2: Mixer:

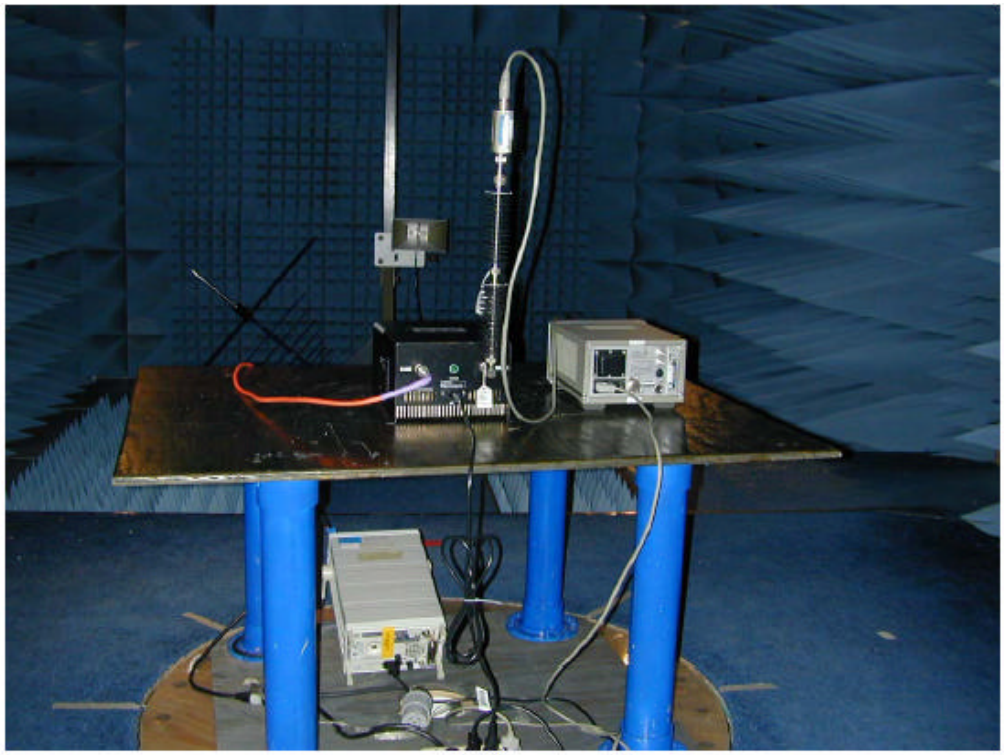
Additional equipment used:

Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
Tx @ 858.5										Downlink
1717.0	-62.0	31.0		32.9	7.3	-13	-56.7	0.0000	V	
2575.5	-62.3	35.5		33	8.0	-13	-51.9	0.0000	V	
3434.0	-62.7	39.8		32.6	8.0	-13	-47.5	0.0000	V	
4292.5	-71.1	45.3		33.2	8.2	-13	-50.8	0.0000	V	
8585.0	-75.0	44.8		33.5	9.4	-13	-54.3	0.0000	V	
1717.0	-65.6	33.0		32.9	7.3	-13	-58.3	0.0000	H	
2575.5	-64.7	35.5		33	8.0	-13	-54.3	0.0000	H	
3434.0	-68.7	36.3		32.6	8.0	-13	-57.0	0.0000	H	
4292.5	-70.2	34.8		33.2	8.2	-13	-60.4	0.0000	H	
8585.0	-75.0	42.2		33.5	9.4	-13	-57.0	0.0000	H	
Tx @ 813.5										Uplink
1627.0	-52.2	33.0		32.9	7.3	-13	-44.9	0.0000	H	
2440.5	-64.8	37.0		33	6.8	-13	-54.1	0.0000	H	
3254.0	-69.2	36.3		32.6	8.0	-13	-57.5	0.0000	H	
4067.5	-71.8	34.8		33.2	8.2	-13	-62.0	0.0000	H	
8135.0	-75.0	42.5		33.5	9.1	-13	-56.9	0.0000	H	
1627.0	-48.3	31.0		32.9	7.3	-13	-43.0	0.0001	V	
2440.5	-58.7	34.2		33	6.8	-13	-50.8	0.0000	V	
3254.0	-66.8	39.8		32.6	8.0	-13	-51.6	0.0000	V	
4067.5	-69.7	45.3		33.2	8.2	-13	-49.4	0.0000	V	
8135.0	-75.0	42.8		33.5	9.1	-13	-56.6	0.0000	V	

Notes: **Scanned to the 10th harmonic of carrier**

Photographs of Test Setup



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1605	LIMITER	FISCHER FCC-45013-1.2	184	01/17/02	01/17/03
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/03/03
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02	07/15/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02	07/15/03
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03

ANNEX A - TEST METHODOLOGIES

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

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

Method Of Measurement:

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

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

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

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Spurious Emissions at Antenna Terminals PARA. NO.: 2.991

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

VBW: $\Rightarrow$ RBW

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

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

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

Table 1

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

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

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

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

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

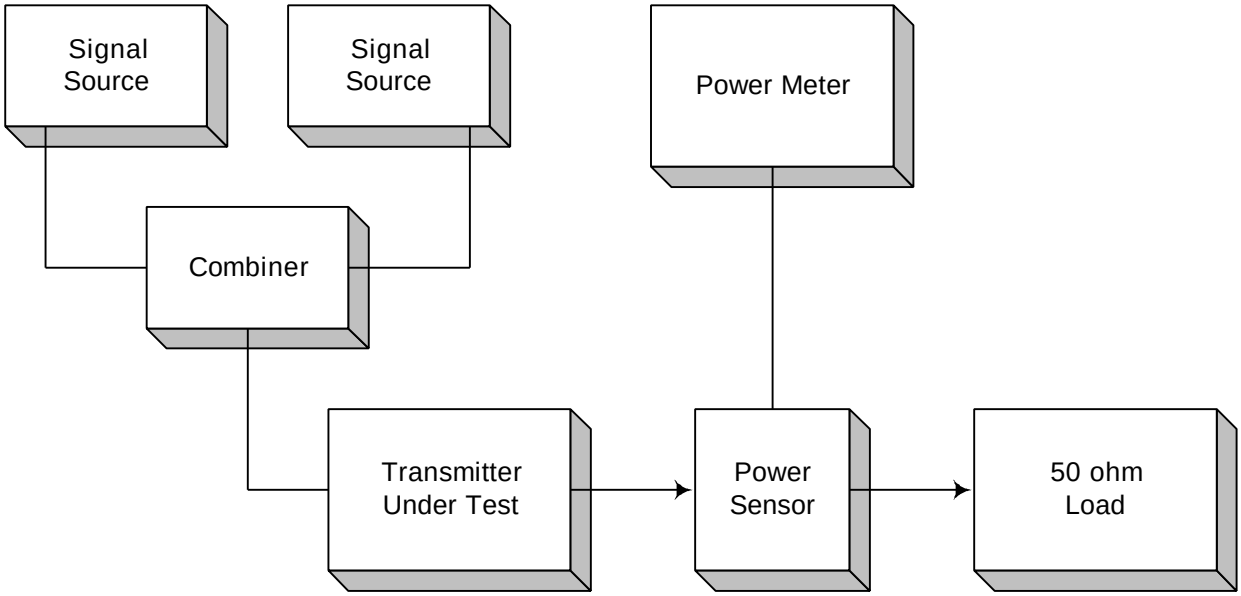
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

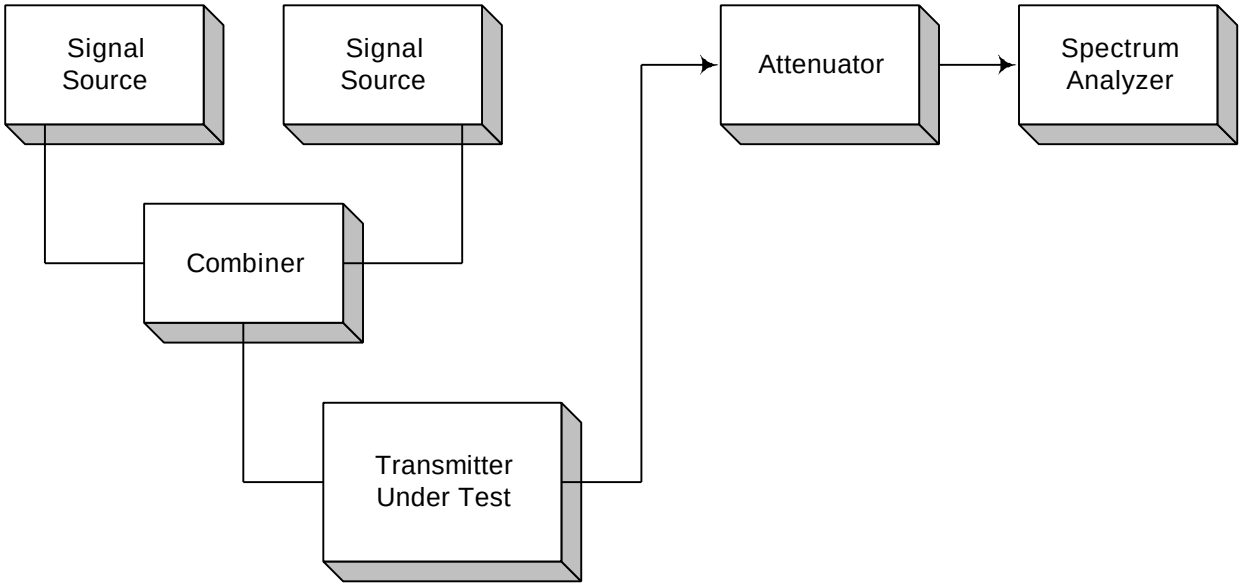
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations > 2 Watts o/p pwr	Mobile Stations < 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0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

ANNEX B - TEST DIAGRAMS

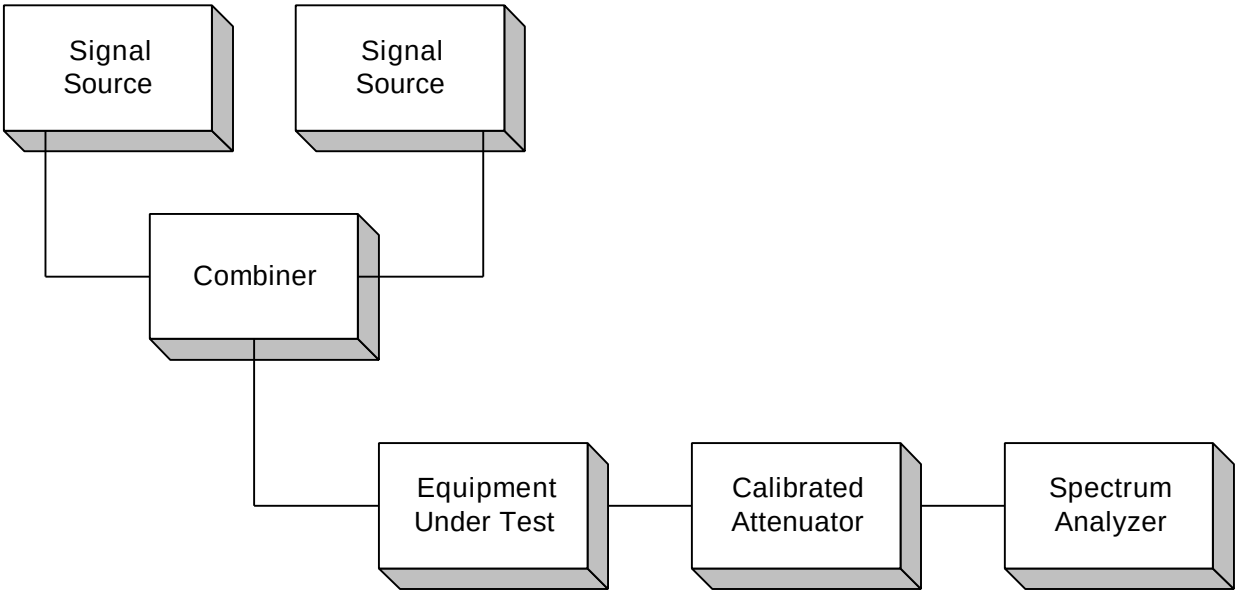
Para. No. 2.985 - R.F. Power Output



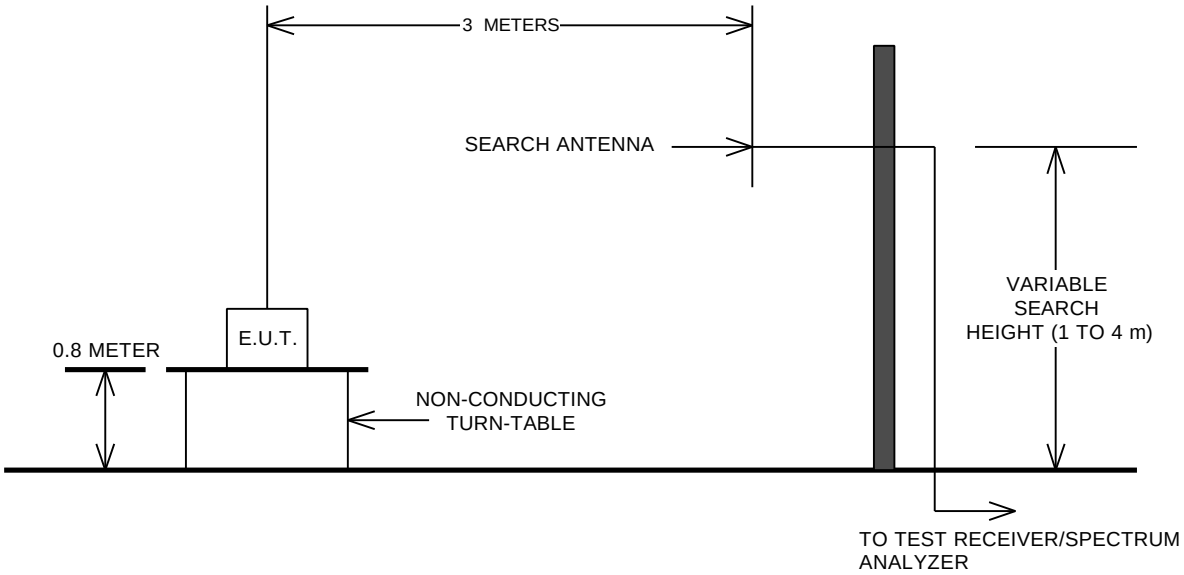
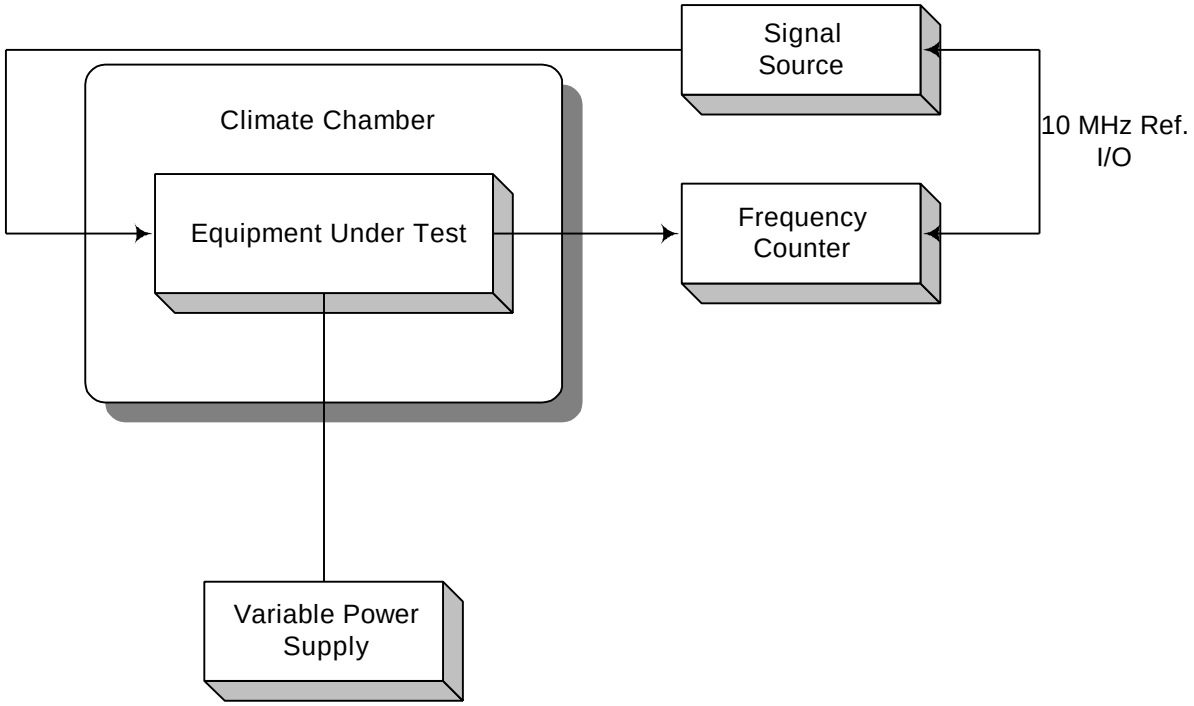
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability