Nemko Test Report No.:	4L0491RUS2REV2
Applicant:	Andrew Corporation
Equipment Under Test:	TFAN 85/19
In Accordance With:	**FCC Part 24, Subpart E** Broadband PCS Repeaters
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	Tom Tidwell, Frontline Group Manager
Date:	18 October, 2004
Total Number of Pages:	42

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAN 85/19

Serial No.: 042202202

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 24, Subpart E.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit

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

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth (CDMA)	24.238	Input/Output	Complies
Occupied Bandwidth (GSM)	24.238	Input/Output	Complies
Occupied Bandwidth (NADC)	24.238	Input/Output	Complies
Occupied Bandwidth (EDGE)	24.238	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235		NA

Footnotes:

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

Measurement uncertainty for each test configuration is expressed to 95% probability.

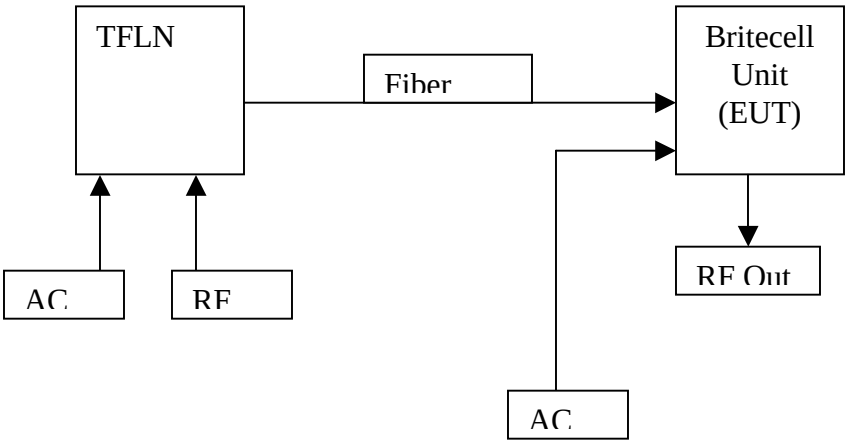
Section 2. General Equipment Specification

Supply Voltage Input:		
Frequency Bands:	**Downlink:**	☒ Block A : 1930 – 1945 MHz ☒ Block D : 1945 – 1950 MHz ☒ Block B : 1950 – 1965 MHz ☒ Block E : 1965 – 1970 MHz ☒ Block F : 1970 – 1975 MHz ☒ Block C : 1975 – 1990 MHz
Frequency Bands:	**Uplink:**	☐ Block A : 1850 – 1865 MHz ☐ Block B : 1865 – 1870 MHz ☐ Block C : 1870 – 1885 MHz ☐ Block D : 1885 – 1890 MHz ☐ Block E : 1890 – 1895 MHz ☐ Block F : 1895 – 1910 MHz
Type of Modulation and Designator:		**CDMA (F9W)** ☒ **GSM (G7W)** ☒ **NADC (DXW)** ☒ **EDGE (GXW)** ☒
Output Impedance:		50 ohms
Max Input:		+10 dBm
RF Output (Rated):	**Uplink**	N/A
RF Output (Rated):	**Downlink**	21 dBm max, Single channel
Frequency Translation:		**F1-F1** ☒ **F1-F2** ☐ **N/A** ☐
Band Selection:		**Software** ☐ **Duplexer** ☐ **Fullband** ☒

Description of Operation

Britecell Plus is a radio over fiber system operation in the 1900 PCS and SMR bands.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Dustin Oaks	DATE:8/13/04

Test Results: Complies.

Measurement Data:

	Modulation Type	Per Channel Output Power (mW)	Per Channel Output Power (dBm)
Uplink	NA		
Downlink	CDMA	5.7	15.12
Uplink	NA		
Downlink	GSM	11.3	21.06
Uplink	NA		
Downlink	EDGE	7.6	17.61
Uplink	NA		
Downlink	NADC	8.5	18.59

Equipment Used: 1627-1036-1604

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 40 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE:7/28/04

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

Test Data – Occupied Bandwidth (Input/Output)

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

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Data Plot — **Occupied Bandwidth**

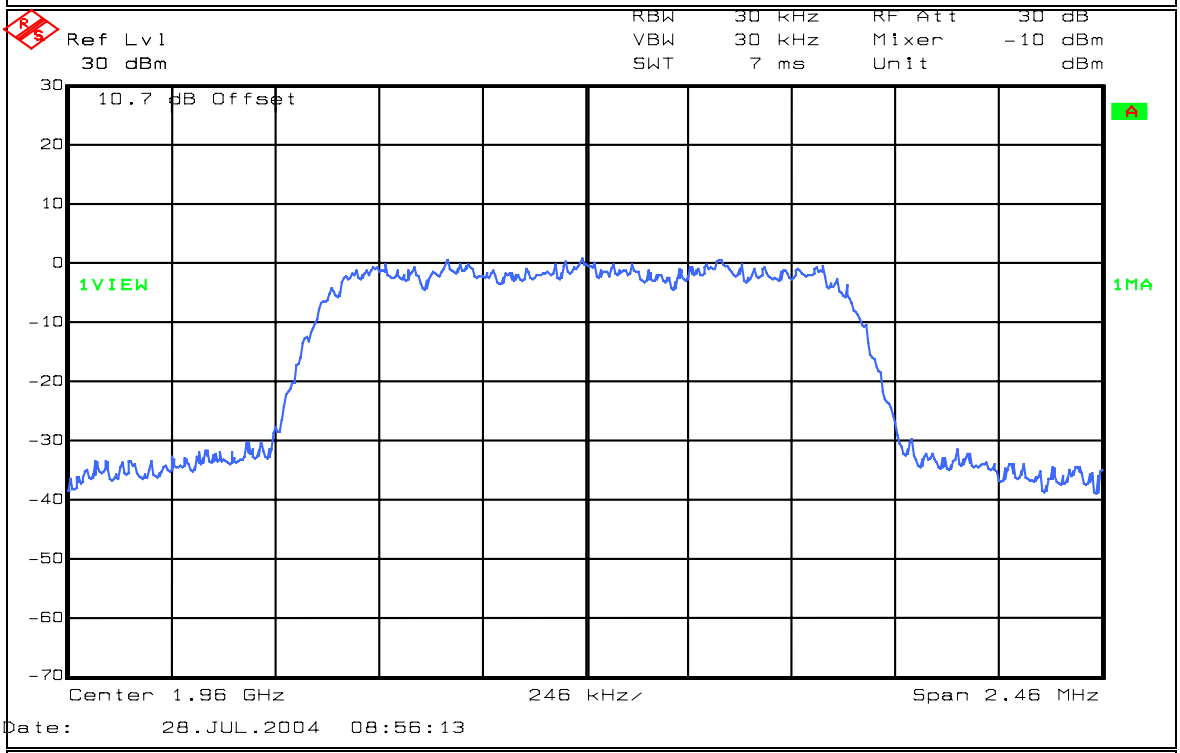
Page 1 of 8

Complete X
Preliminary:

Job No.:
Date: 7/28/2004
Specification:
Temperature(°C): 22
Tested By: David Light
Relative Humidity(%) 40
E.U.T.: dual band amp
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: 1626
Filter:
Cable #2: 1627
Receiver: 1036
Cable #3:
Attenuator #1 1471
Cable #4:
Attenuator #2:
Mixer:
Additional equipment used:
Measurement Uncertainty: +/-1.7 dB



Notes: **OUTPUT CDMA**

Test Data – Occupied Bandwidth (Input/Output)

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

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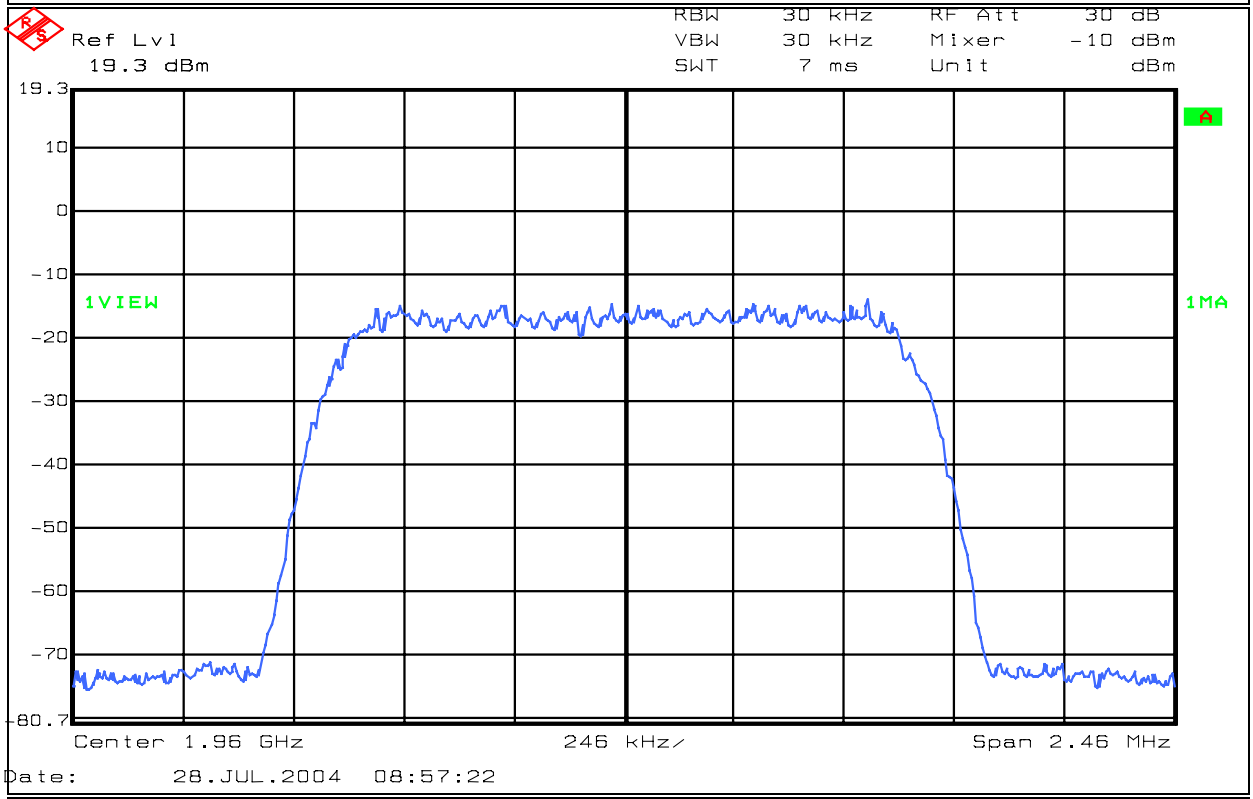
Data Plot **Occupied Bandwidth**

Page 2 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **INPUT CDMA**

Test Data – Occupied Bandwidth (Input/Output)

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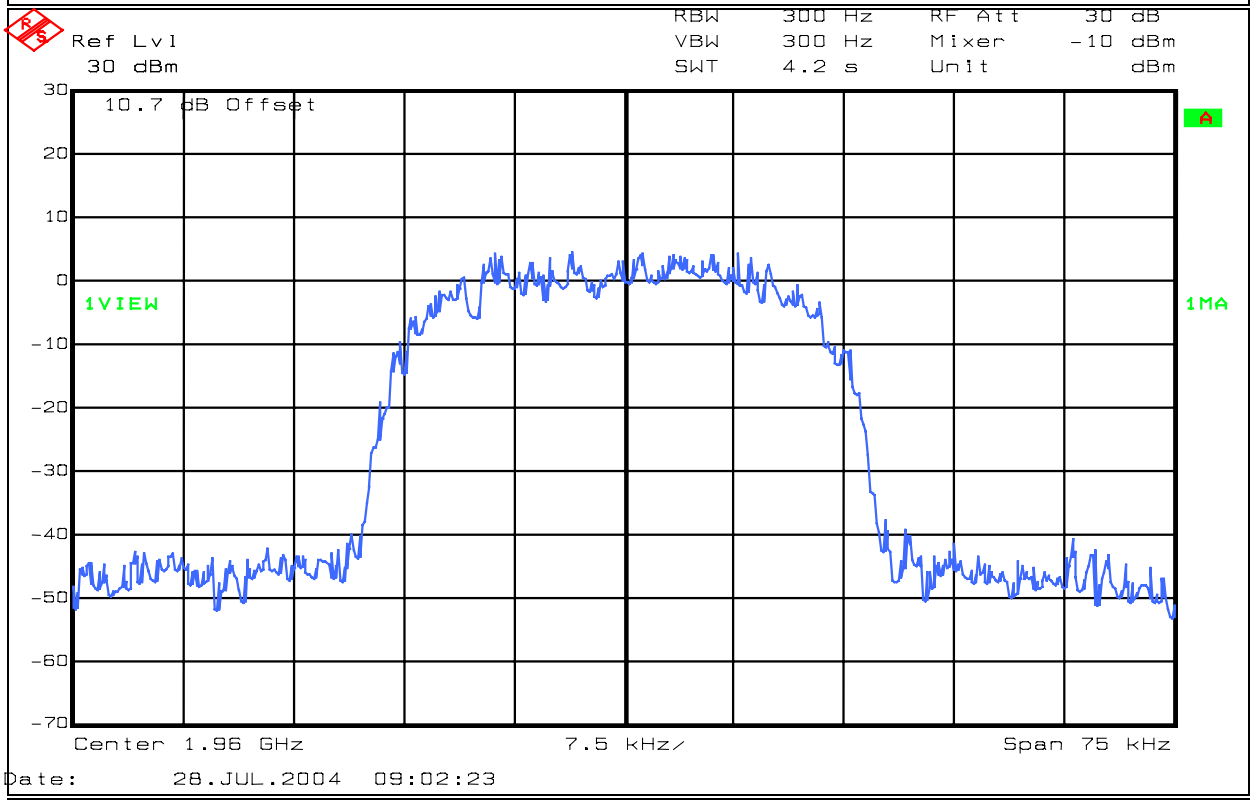
Data Plot **Occupied Bandwidth**

Page 3 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **TDMA OUTPUT**

Test Data – Occupied Bandwidth (Input/Output)

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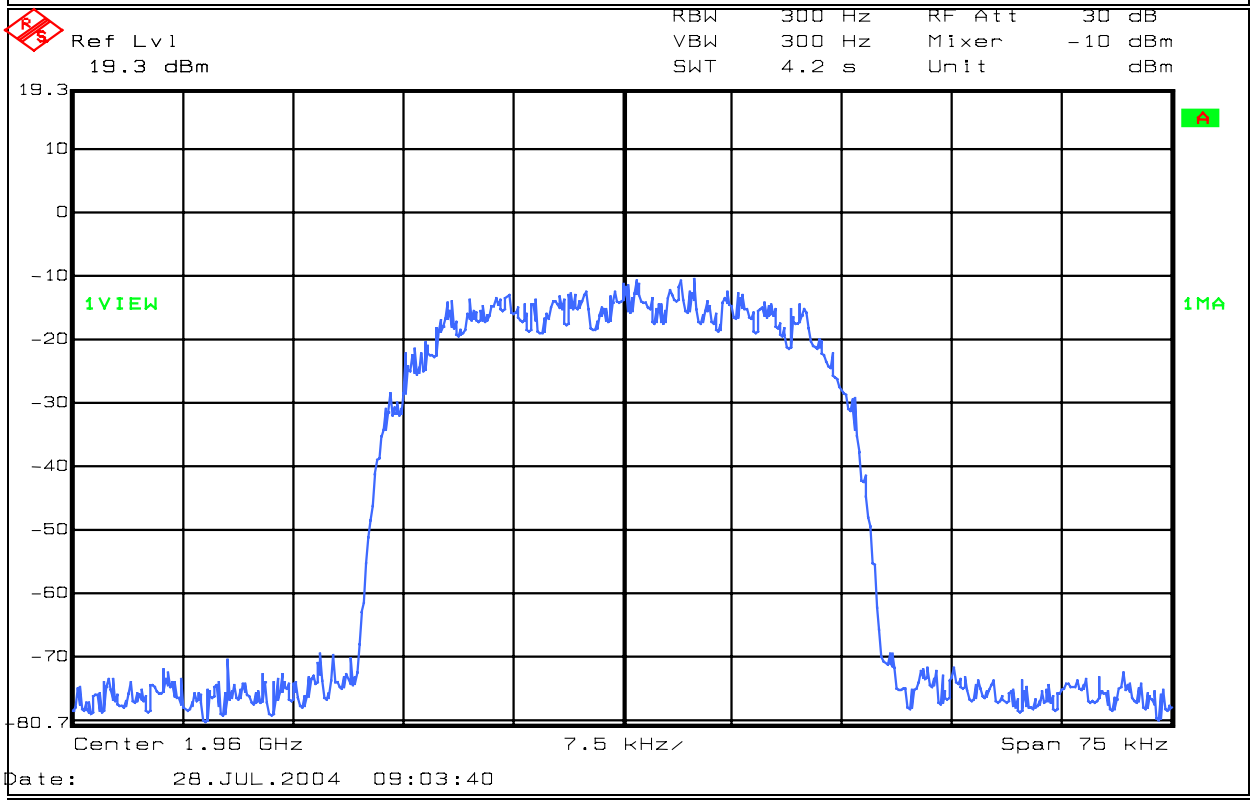
Data Plot **Occupied Bandwidth**

Page 4 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **TDMA INPUT**

Test Data – Occupied Bandwidth (Input/Output)

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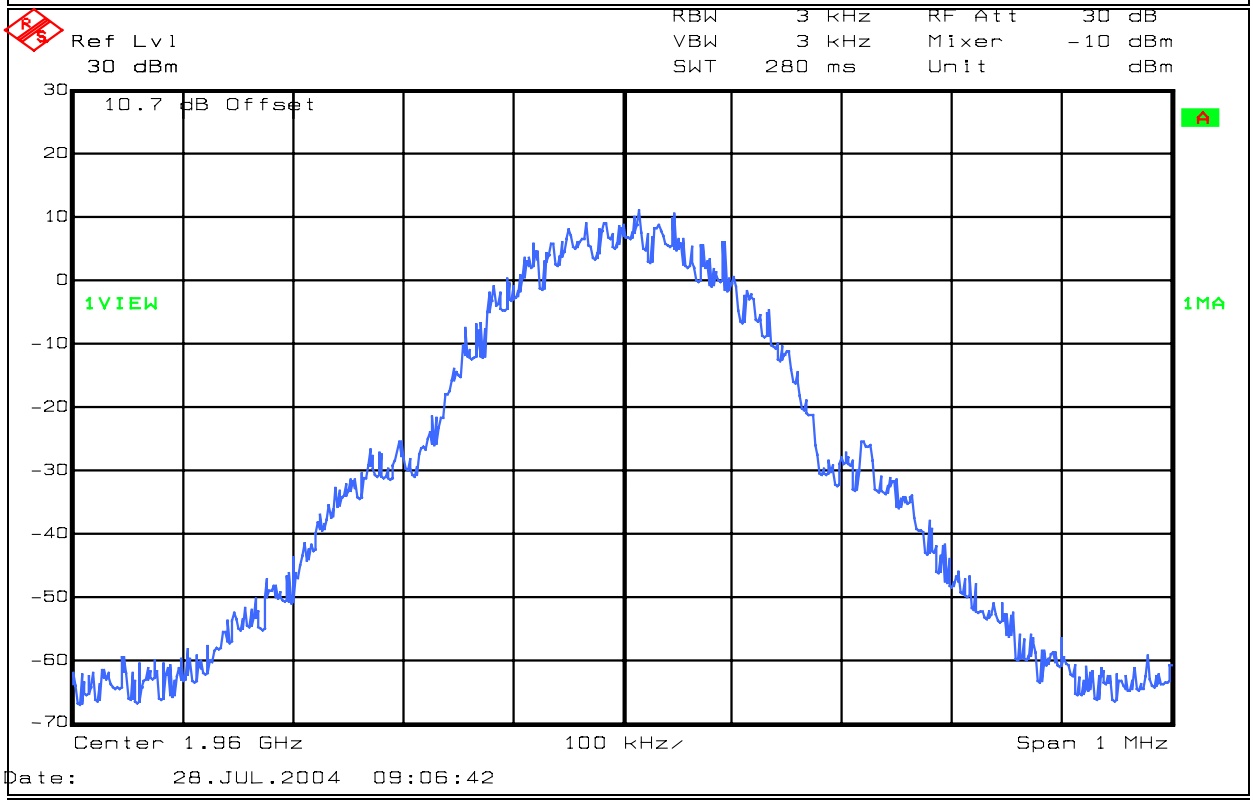
Data Plot **Occupied Bandwidth**

Page 5 of 8

Job No.:
Date: 7/28/2004
Specification:
Temperature(°C): 22
Tested By: David Light
Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **OUTPUT GSM**

Test Data – Occupied Bandwidth (Input/Output)

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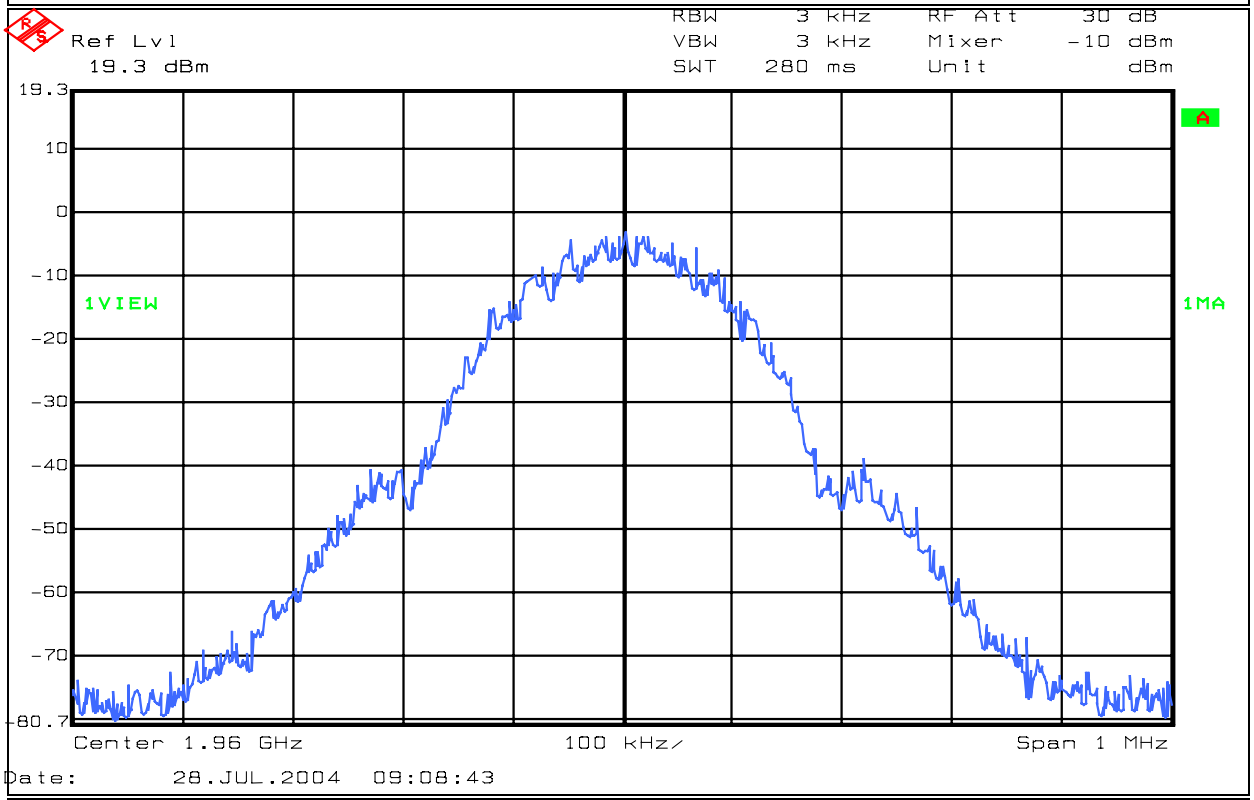
Data Plot **Occupied Bandwidth**

Page 6 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **INPUT GSM**

Test Data – Occupied Bandwidth (Input/Output)

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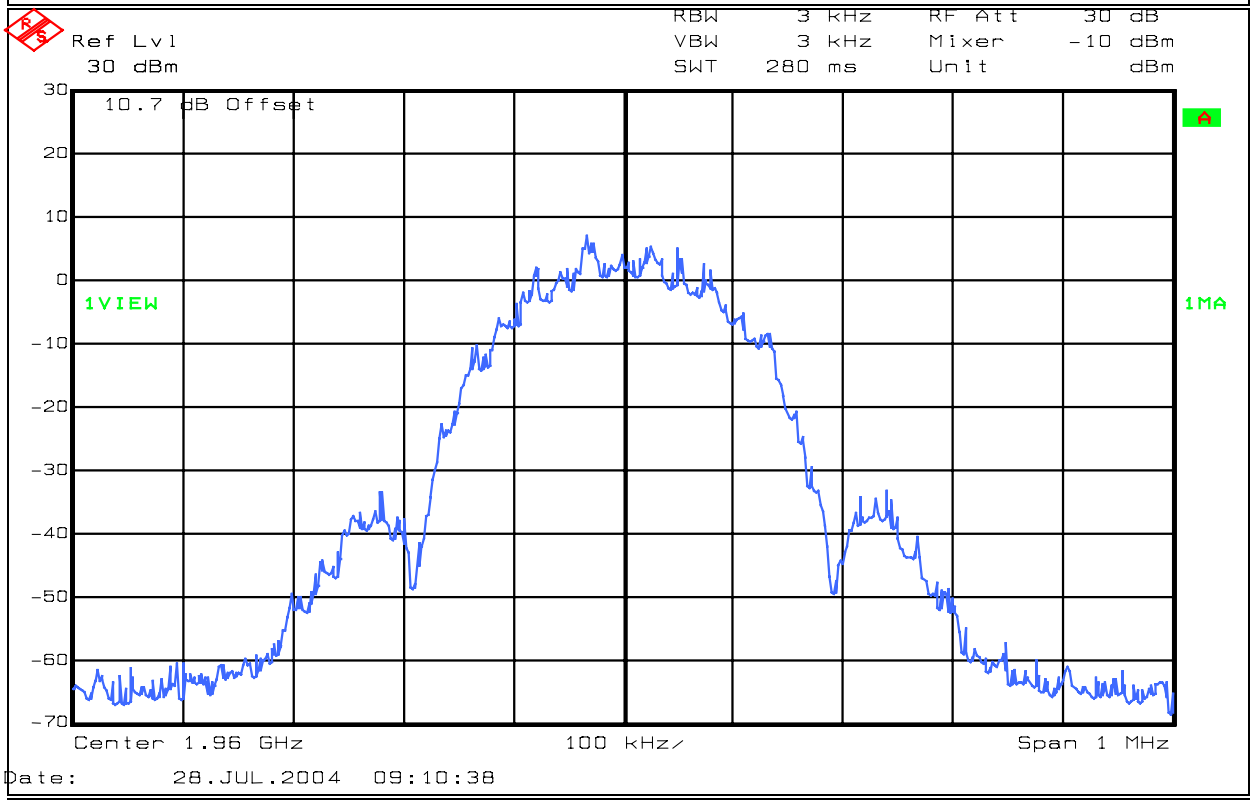
Data Plot **Occupied Bandwidth**

Page 6 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **OUTPUT EDGE**

Test Data – Occupied Bandwidth (Input/Output)

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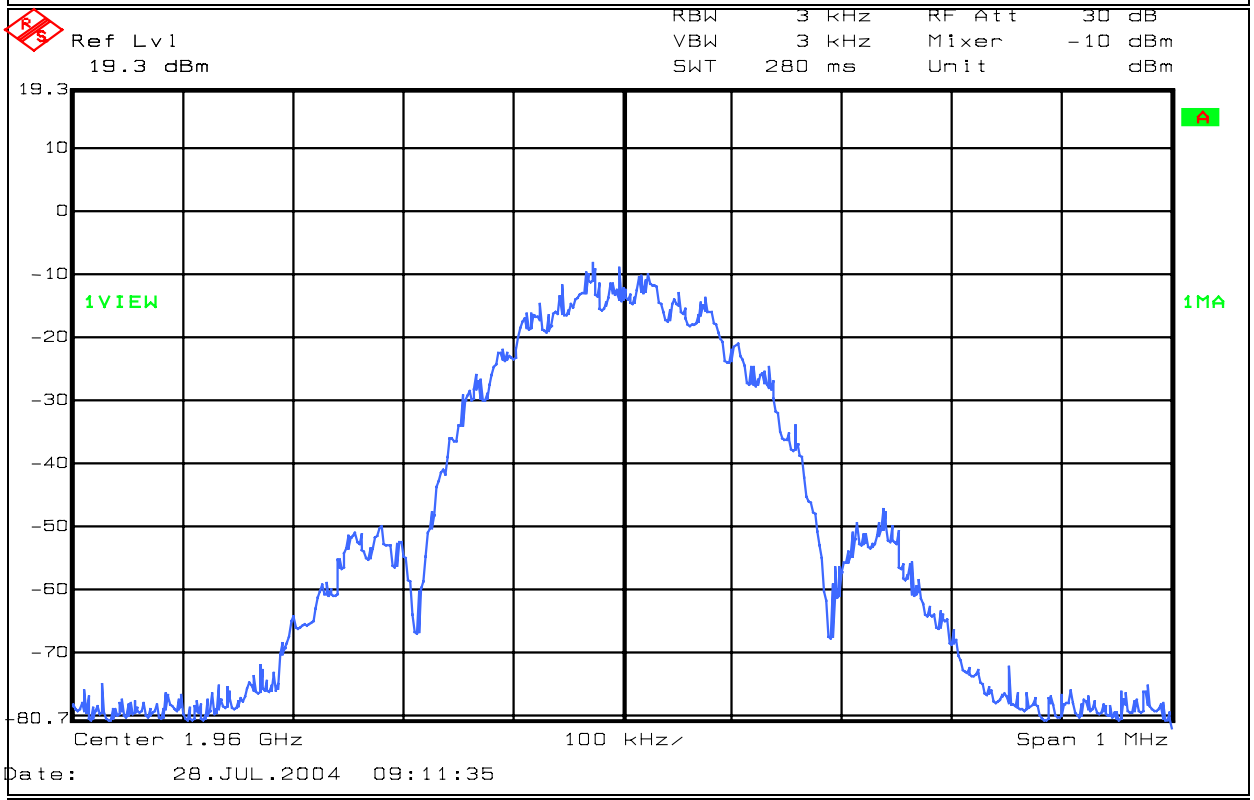
Data Plot **Occupied Bandwidth**

Page 6 of 8

Job No.: Date: 7/28/2004
Specification: Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: dual band amp
Configuration: Tx Full power



Notes: **INPUT EDGE**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE:7/28/04

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

Test Data – Spurious Emissions at Antenna Terminals

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

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics**

Page 1 of 8

Complete X

Job No.: Date: 10/18/2004 Preliminary:

Specification: PT24 Temperature(°C): 25

Tested By: David Light Relative Humidity(%) 45

E.U.T.: PCS REPEATER

Configuration: TX

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

Detector Type: Refer to plots VBW: Refer to plots Distance: na m

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1629

Filter: Cable #2:

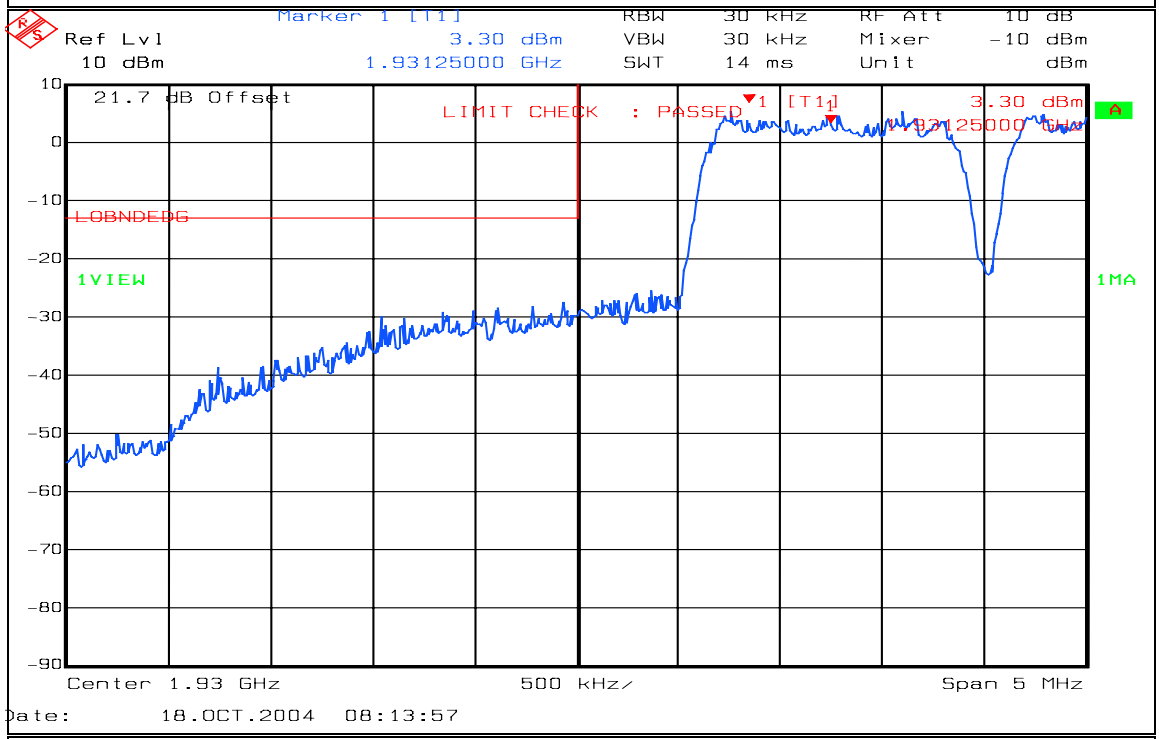
Receiver: 1036 Cable #3:

Attenuator #1 1064 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **CDMA**

11 dBm per carrier - 14 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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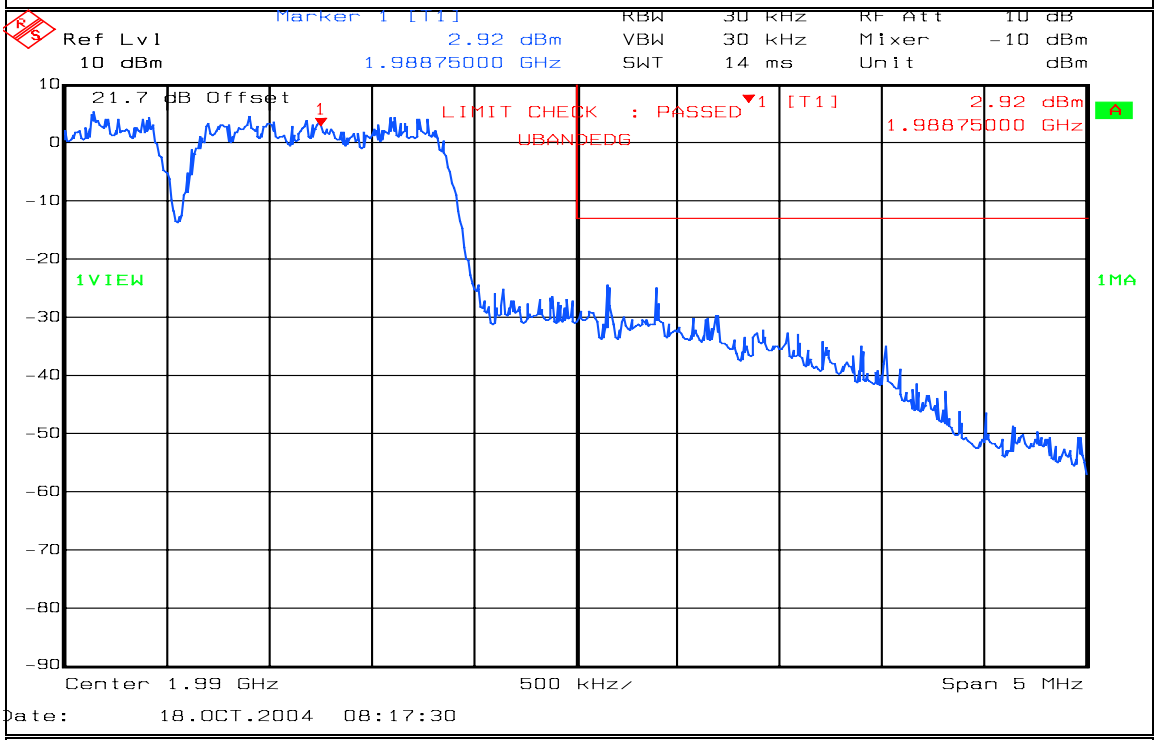
Data Plot **Intermodulation Characteristics**

Page 2 of 8

Job No.: Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **CDMA**
11 dBm per carrier - 14 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

Nemko

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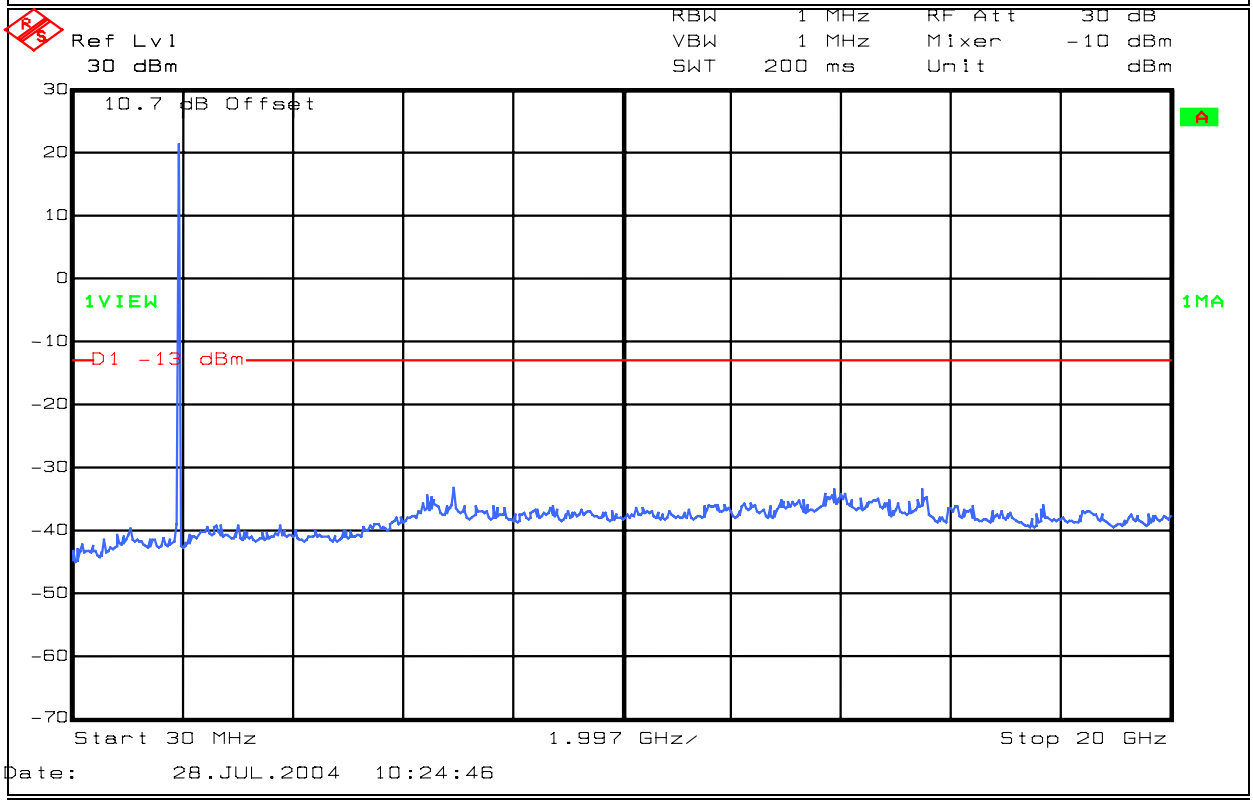
Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 5

Job No.:	4L0490R	Date:	7/28/2004
Specification:	PT24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	Dual band amp		
Configuration:	Tx Full power		



Notes: **CDMA - SINGLE CARRIER 14 dBm**
TX 1960 MHz

The spectrum was investigated in detail on three channels. The plot shown is indicative of the noise floor readings found for all channels and modulations.

Test Data – Spurious Emissions at Antenna Terminals

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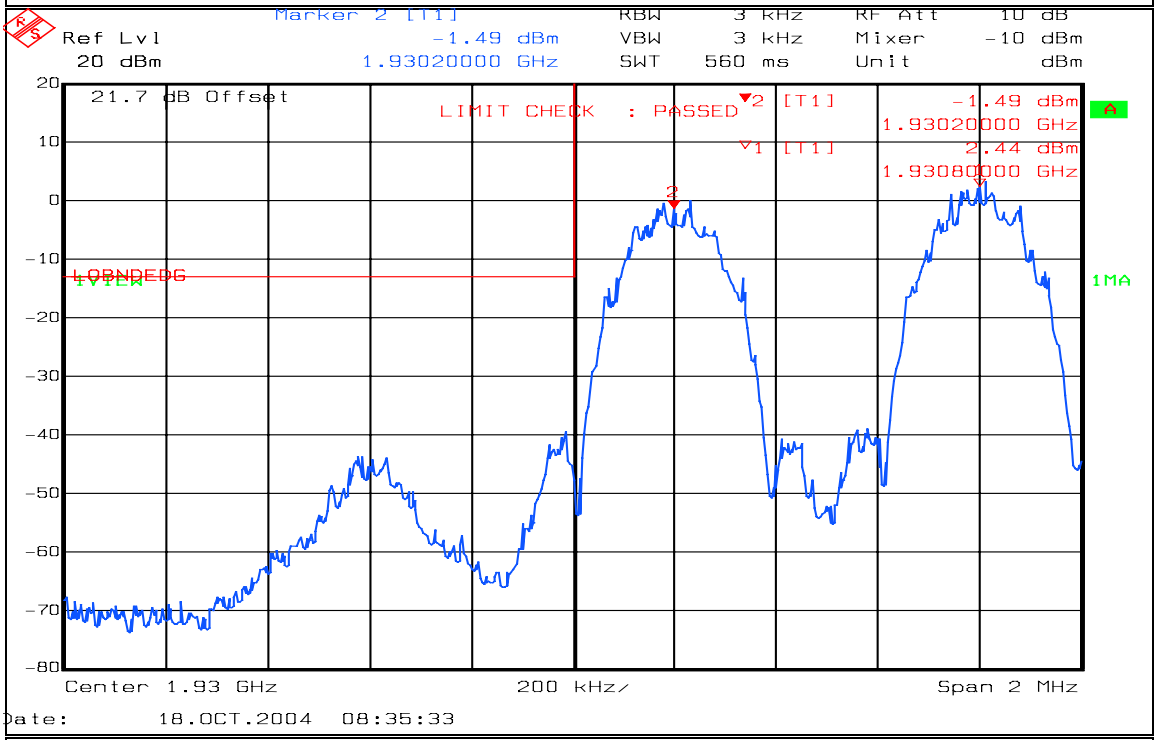
Data Plot **Intermodulation Characteristics**

Page 5 of 8

Job No.:
Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **EDGE**
12.5 dBm per carrier - 15.5 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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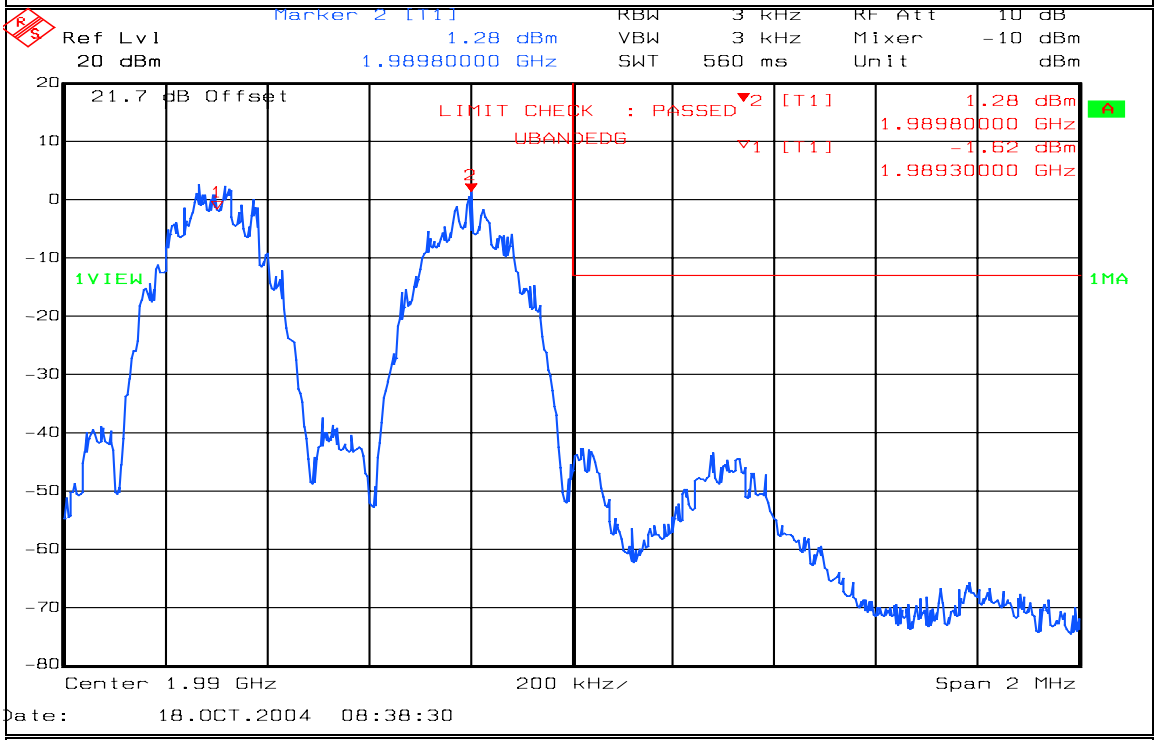
Data Plot **Intermodulation Characteristics**

Page 6 of 8

Job No.: Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **EDGE**
12.5 dBm per carrier - 15.5 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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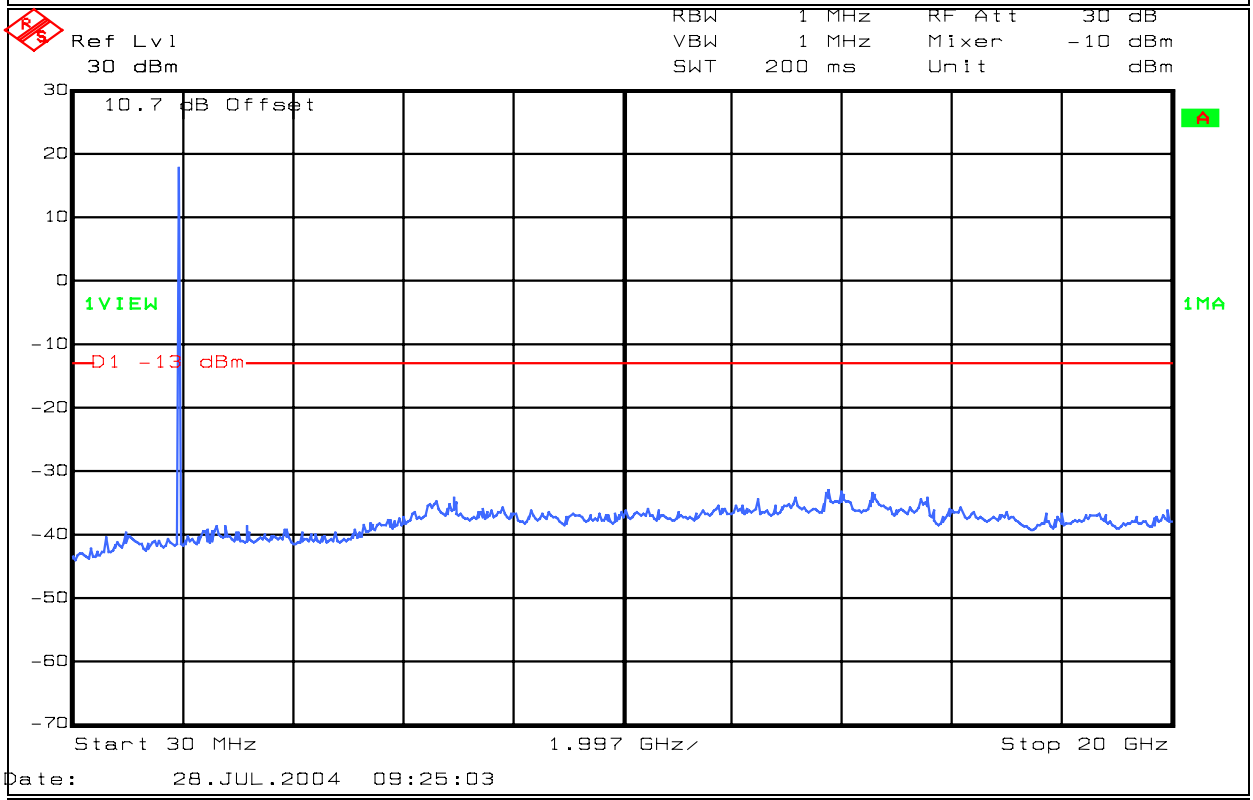
Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 5

Job No.:	4L0490R	Date:	7/28/2004
Specification:	PT24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	DUAL BAND AMP		
Configuration:	TX FULL POWER		



Notes: **EDGE - SINGLE CARRIER 16.5 dBm**
TX 1960 MHz

Test Data – Spurious Emissions at Antenna Terminals

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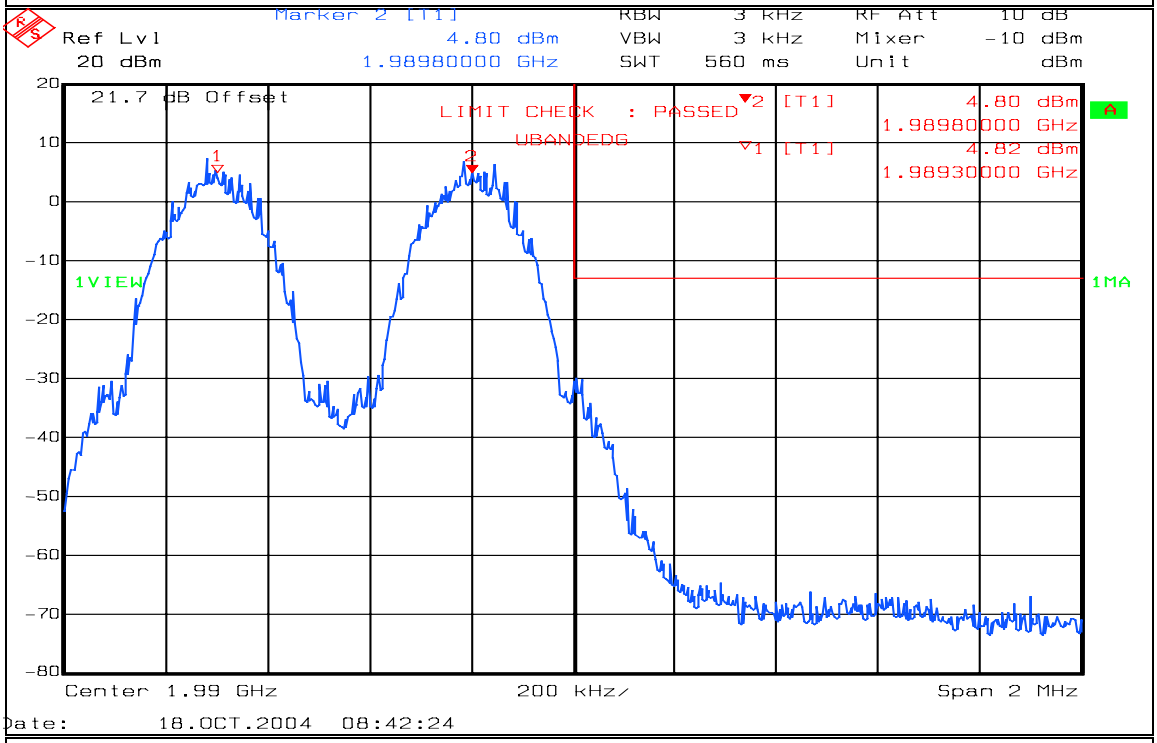
Data Plot **Intermodulation Characteristics**

Page 7 of 8

Job No.: Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **GSM**
14.5 dBm per carrier - 17.5 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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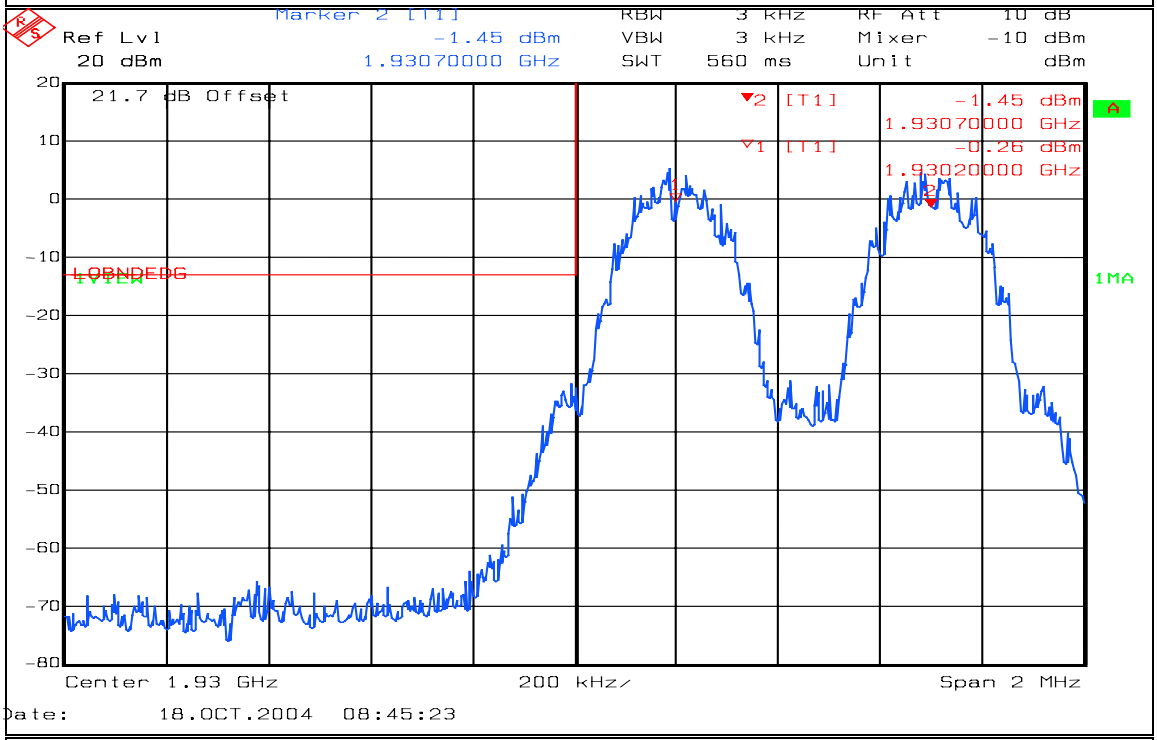
Data Plot **Intermodulation Characteristics**

Page 8 of 8

Job No.:
Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **GSM**
14.5 dBm per carrier - 17.5 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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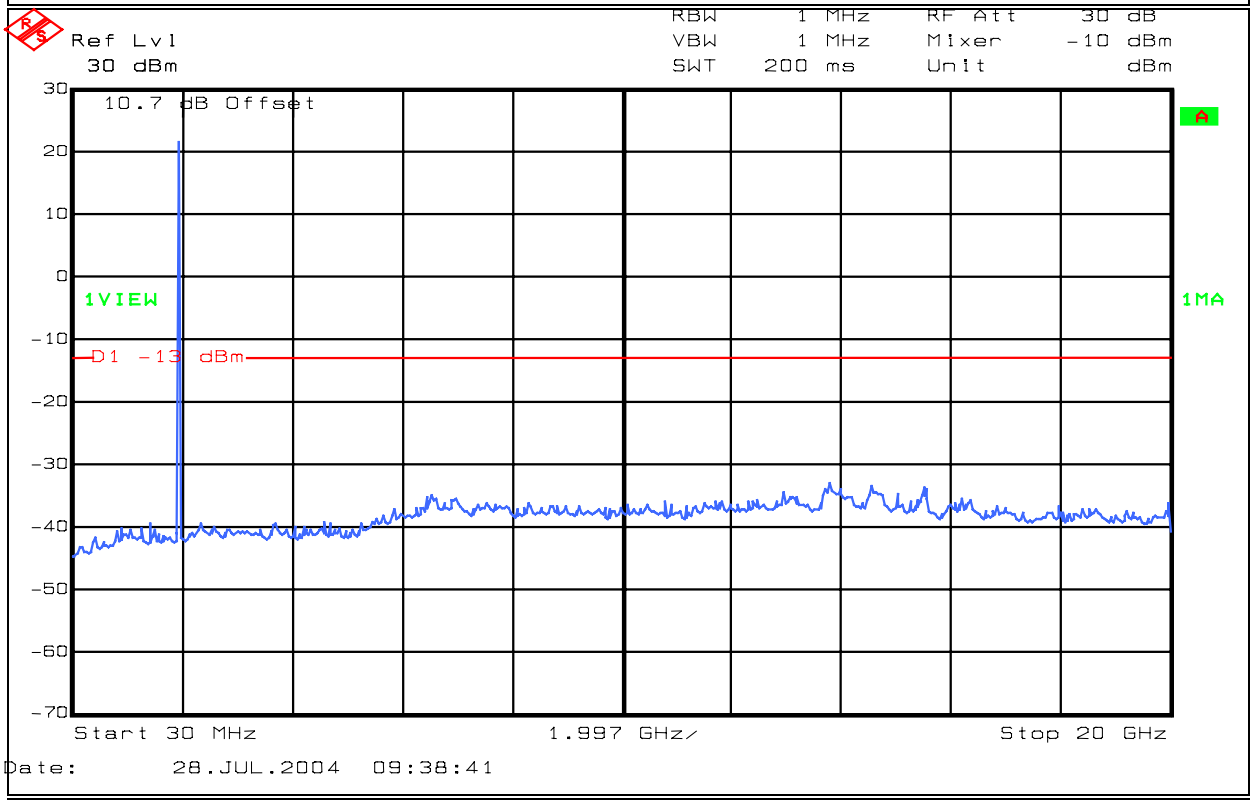
Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 6

Job No.:	4L0490	Date:	7/28/2004
Specification:	PT24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	DUAL BAND AMP		
Configuration:	TX FULL POWER		



Notes: **GSM - SINGLE CARRIER 20 dBm**
TX 1960 MHz

Test Data – Spurious Emissions at Antenna Terminals

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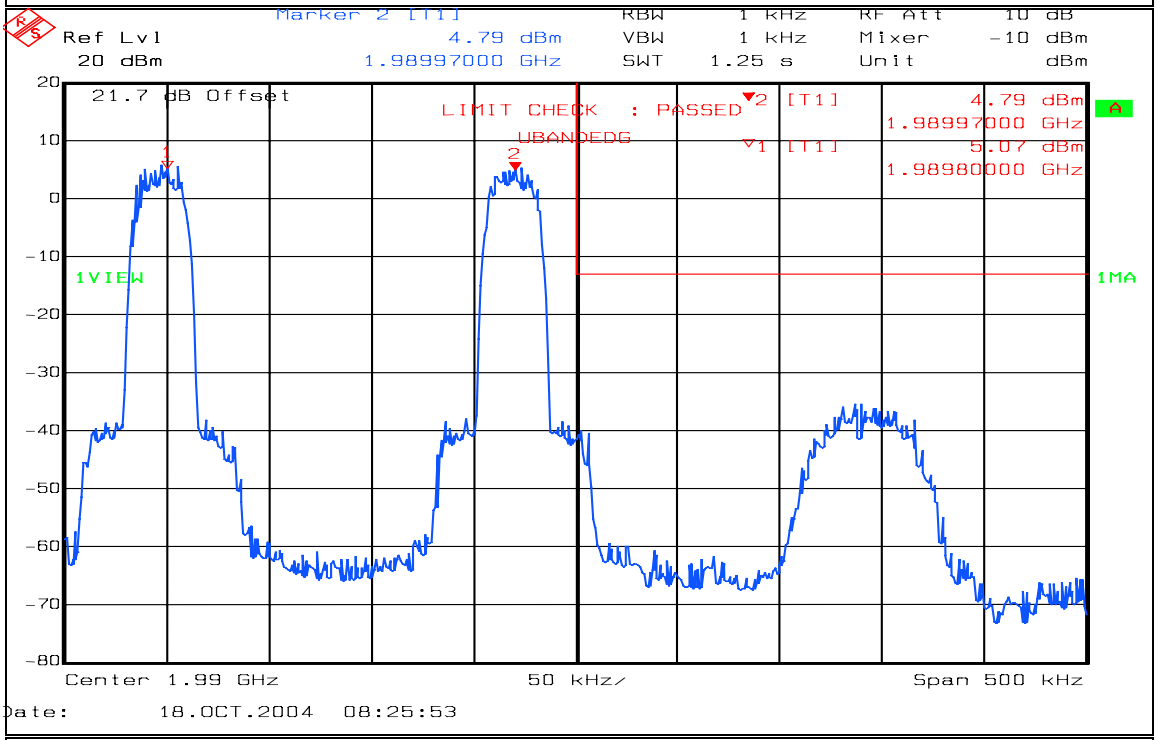
Data Plot **Intermodulation Characteristics**

Page 3 of 8

Job No.:
Date: 10/18/2004
Specification: PT24 Temperature(°C): 25
Tested By: David Light Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **TDMA**
13 dBm per carrier - 16 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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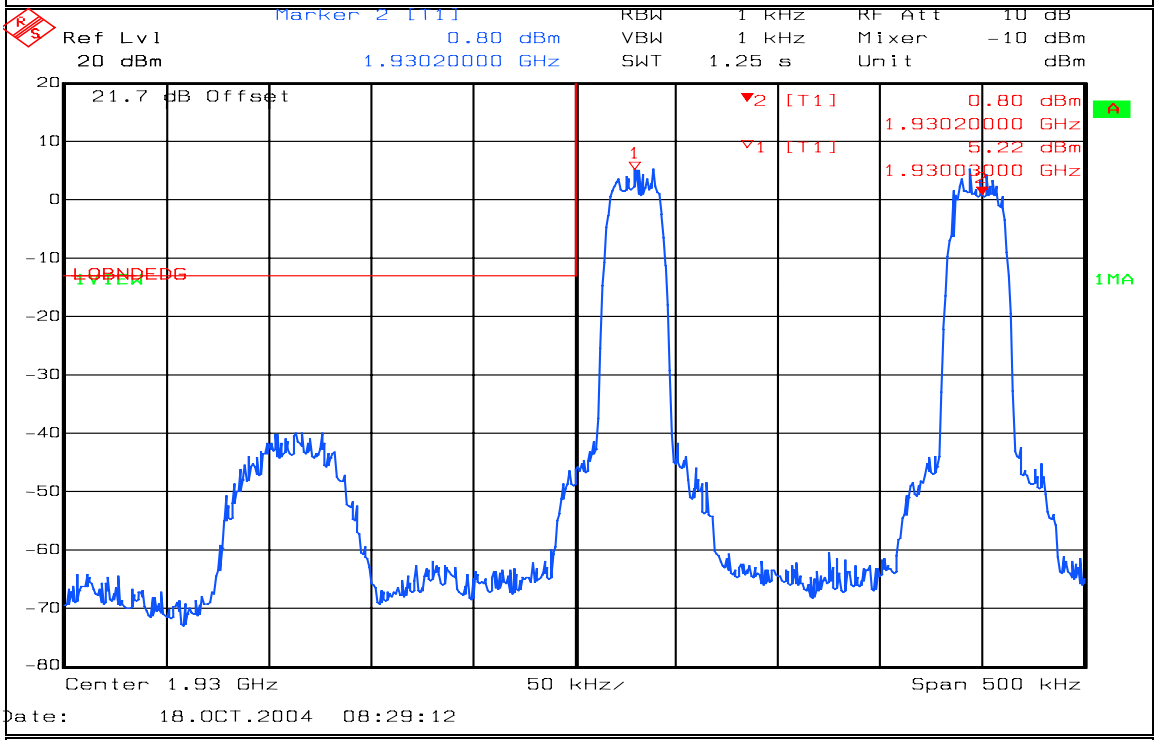
Data Plot **Intermodulation Characteristics**

Page 4 of 8

Job No.:
Date: 10/18/2004
Specification: PT24
Temperature(°C): 25
Tested By: David Light
Relative Humidity(%) 45
E.U.T.: PCS REPEATER
Configuration: TX



Notes: **TDMA**
13 dBm per carrier - 16 dBm Composite

Test Data – Spurious Emissions at Antenna Terminals

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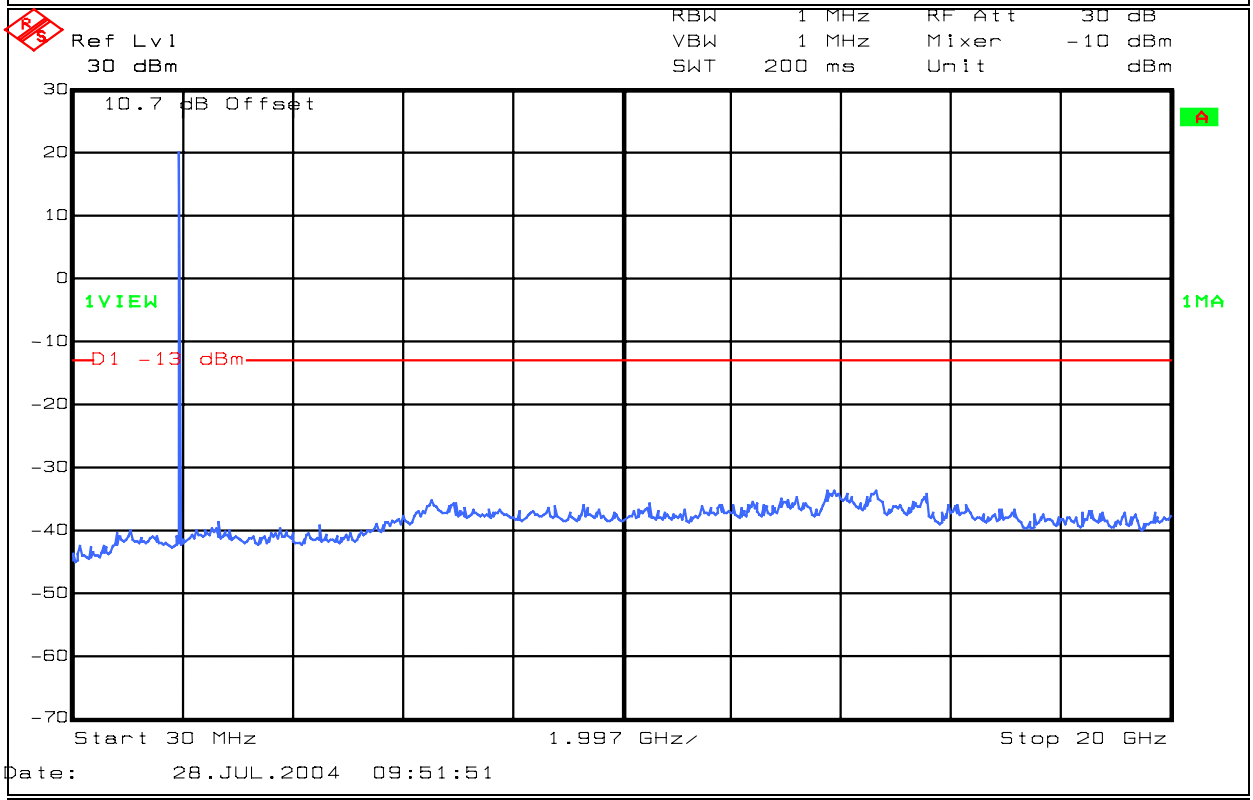
Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 5

Job No.:	4L0490R	Date:	7/28/2004
Specification:	PT24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	DUAL BAND AMP		
Configuration:	TX FULL POWER		



Notes: **TDMA - SINGLE CARRIER 17.5 dBm**
TX 1960 MHz

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: Brian Boyea	DATE: 7/29/04

Test Results: Complies.

Test Data: There were no emissions detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm EIRP. The spectrum was searched to the 10^{th} harmonic of the carrier and was investigated on 3 channels.

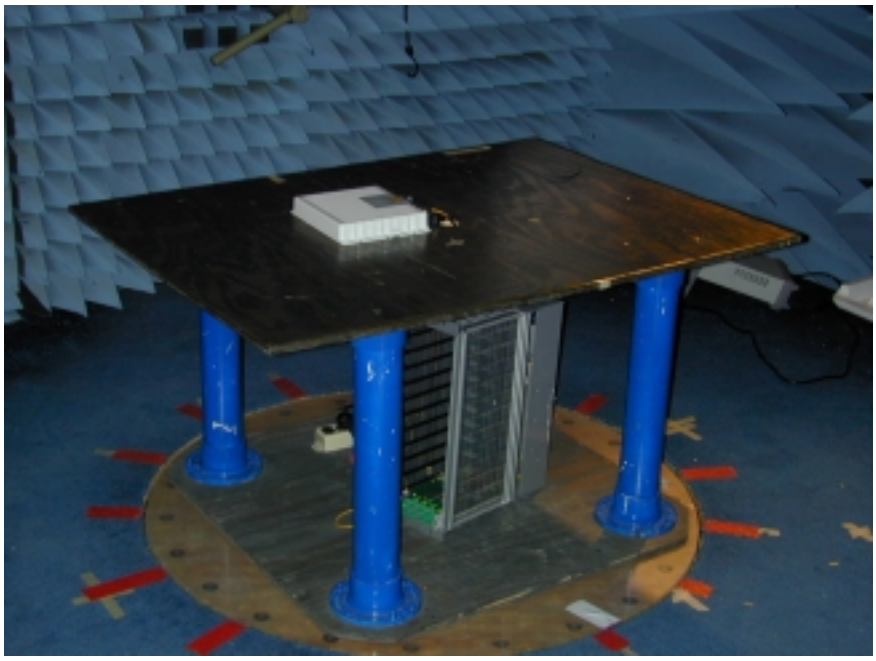
Equipment Used: 1484-1485-1016-1484

Measurement Uncertainty: +/- 1.7 dB

Temperature: 21 °C

Relative Humidity: 42 %

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	03/22/04	03/23/06
1471	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1627	CABLE, 5 ft	MEGAPHASE 10312 1GVT4	N/A	CBU	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/30/04	07/30/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/30/04	07/30/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	**PARA. NO.: 2.1046**

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

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.

NAME OF TEST: Occupied Bandwidth	**PARA. NO.: 2.1047**

Minimum Standard: Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least 43 + 10 log (P) dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

NAME OF TEST: Field Strength of Spurious Radiation	**PARA. NO.: 2.1053**

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least 43 + 10 log (P) dB.

Test Method: The substitution antenna method was used to measure eirp 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 an isotropic radiator. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The eirp of the spurious signal is the level required to repeat the previously measured level.

NAME OF TEST: Frequency Stability	**PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

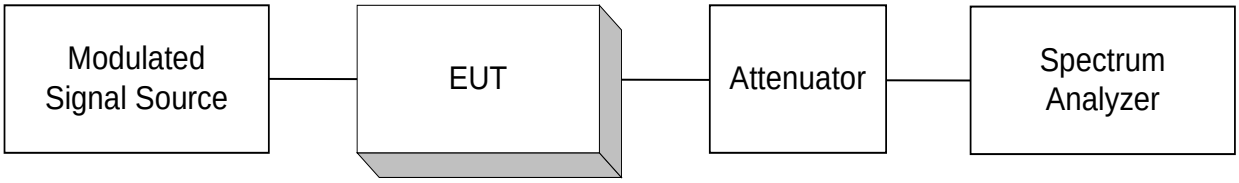
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

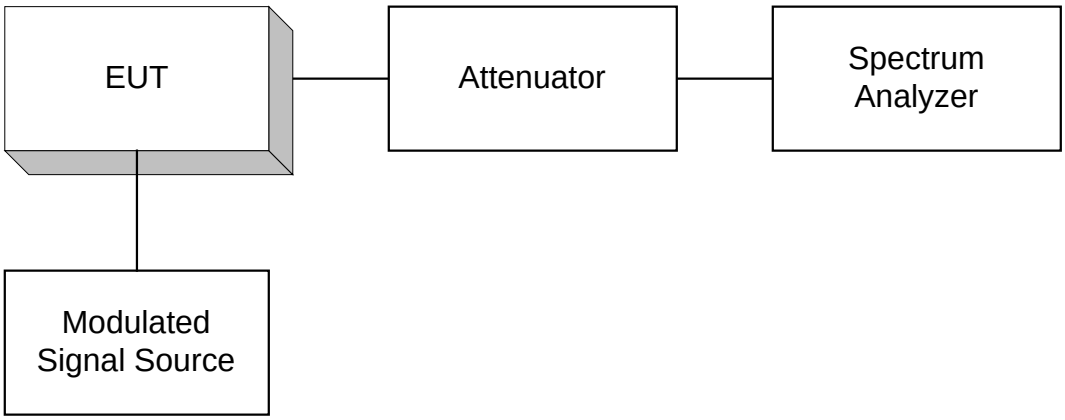
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

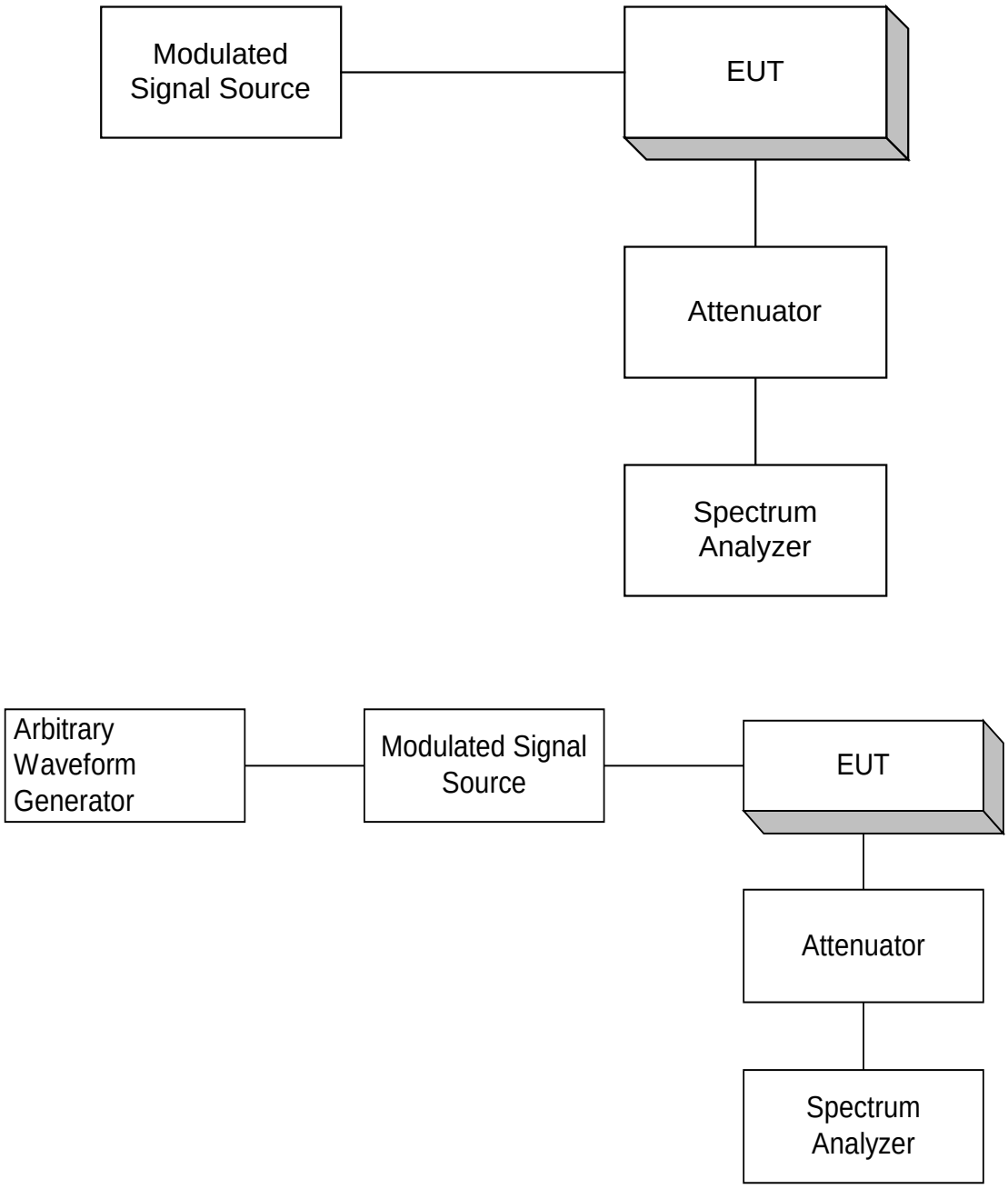
Para. No. 2.985 - R.F. Power Output



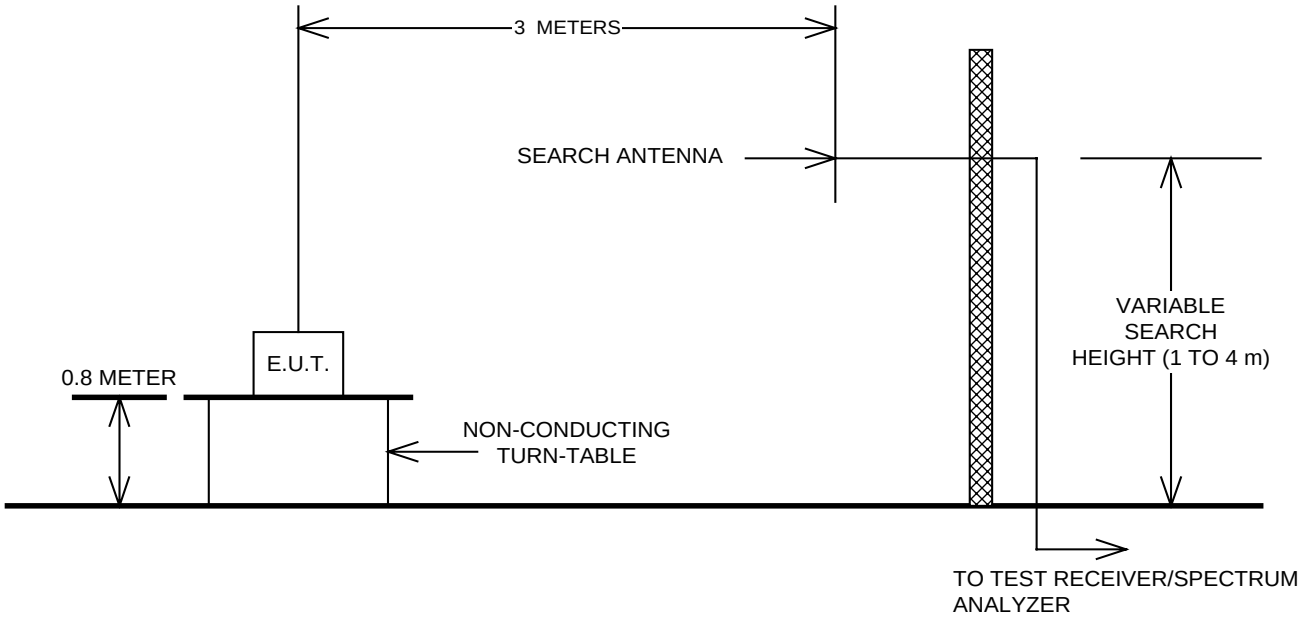
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability