Nemko Test Report:	4L0570RUS1
Applicant:	Andrew Corporation 108 Rand Park Drive Garner, NC 27529
Equipment Under Test: (E.U.T.)	TFAH 85/19
In Accordance With:	**FCC Part 22, Subpart H** Cellular Band Repeaters
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 Tom Tidwell, Frontline Group Manager
Date:	9/1/04
Total Number of Pages:	53

Table of Contents

Section 1. Summary of Test Results

Manufacturer:	Andrew Corporation
Model No.:	TFAH 85/19
Serial No.:	043003041

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 22, Subpart H.

☒	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	22.913(a)	500W ERP	Complies
Occupied Bandwidth	22.917(c)	Input/Output	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	NA

Footnotes:

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

.

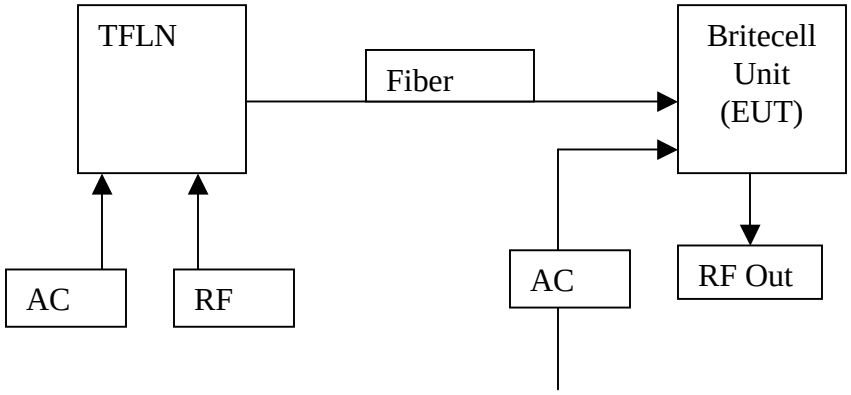
Section 2. General Equipment Specification

Supply Voltage Input:		115 Vac				
Frequency Range:	**Downlink:**	869 – 894 MHz				
Frequency Range:	**Uplink:**	NA				
Type of Modulation and Designator:		**CDMA (F9W)** ☒	**GSM (GXW)** ☒	**NADC (D7W)** ☒	**EDGE (D7W)** ☒	**AMPS (F8W, F1D)** ☒
Output Impedance:		50 ohms				
RF Output (Rated):	**Downlink:**	Modulation	1 Carrier	2 Carriers		
		Analog	37	27		
		CDMA	31	24.5		
		GSM	37	27		
		EDGE	33.5	25		
		TDMA	34.5	25.5		
Frequency Translation:		**F1-F1** ☒	**F1-F2** ☐	**N/A** ☐		
Band Selection:		**Software** ☐	**Duplexer Change** ☐	**Fullband Coverage** ☒		

Description of Operation

TFAH 85/19 is a fiber based tri-band repeater operating in the 800 MHz SMR, the 800 MHz cellular and the 1900 MHz PCS bands

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 8/30/04

Test Results: Complies.

Test Data:

Direction	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Downlink	AMPS	27	30
Downlink	CDMA	24.5	27.5
Downlink	GSM	27	30
Downlink	NADC	25	28
Downlink	CDPD	25.5	28.5

Equipment Used: 1036-1065-1604-1629

Measurement Uncertainty: +/- 1.7 dB

Temperature: 25 °C

Relative Humidity: 40 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 8/30/04

Test Results: Complies.

Test Data: See attached plots

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 — **Occupied Bandwidth**

Page 1 of 2 — Complete: X — Preliminary:

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

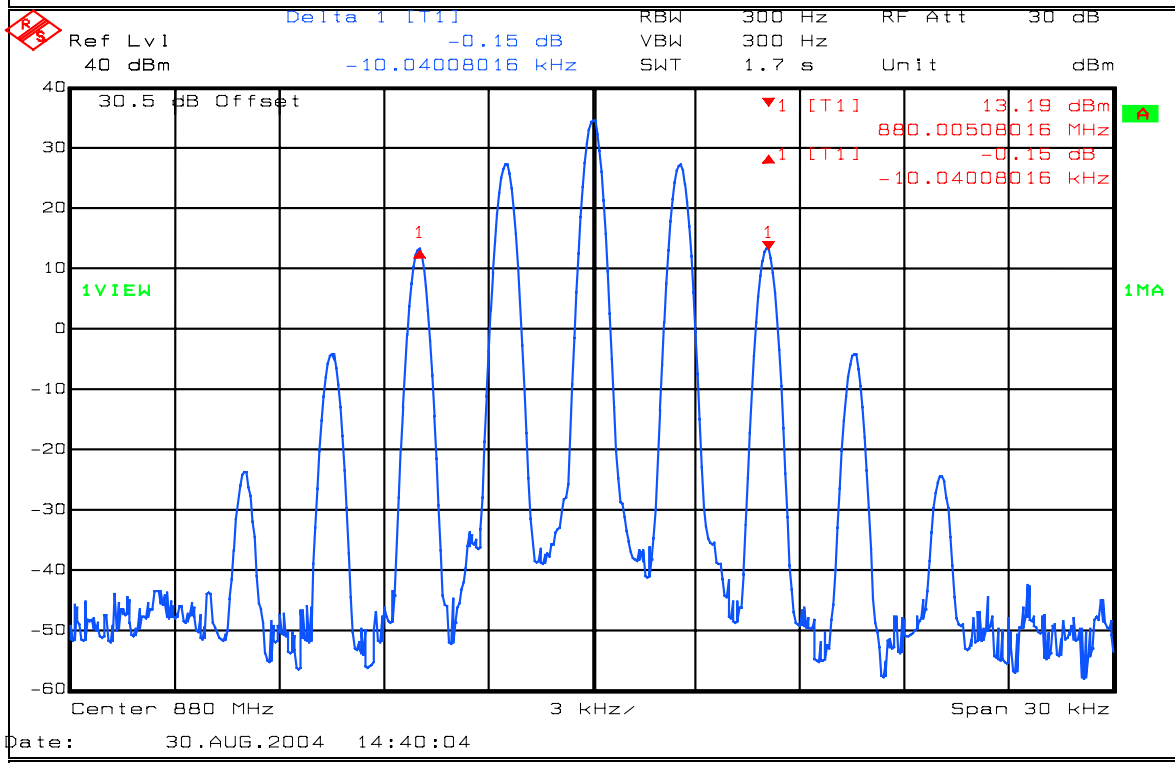
Measurement Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes:
ANALOG OUTPUT
MAX POWER 37 dBm
2 kHz Tone - 2.5 kHz Deviation

Test Data – Occupied Bandwidth

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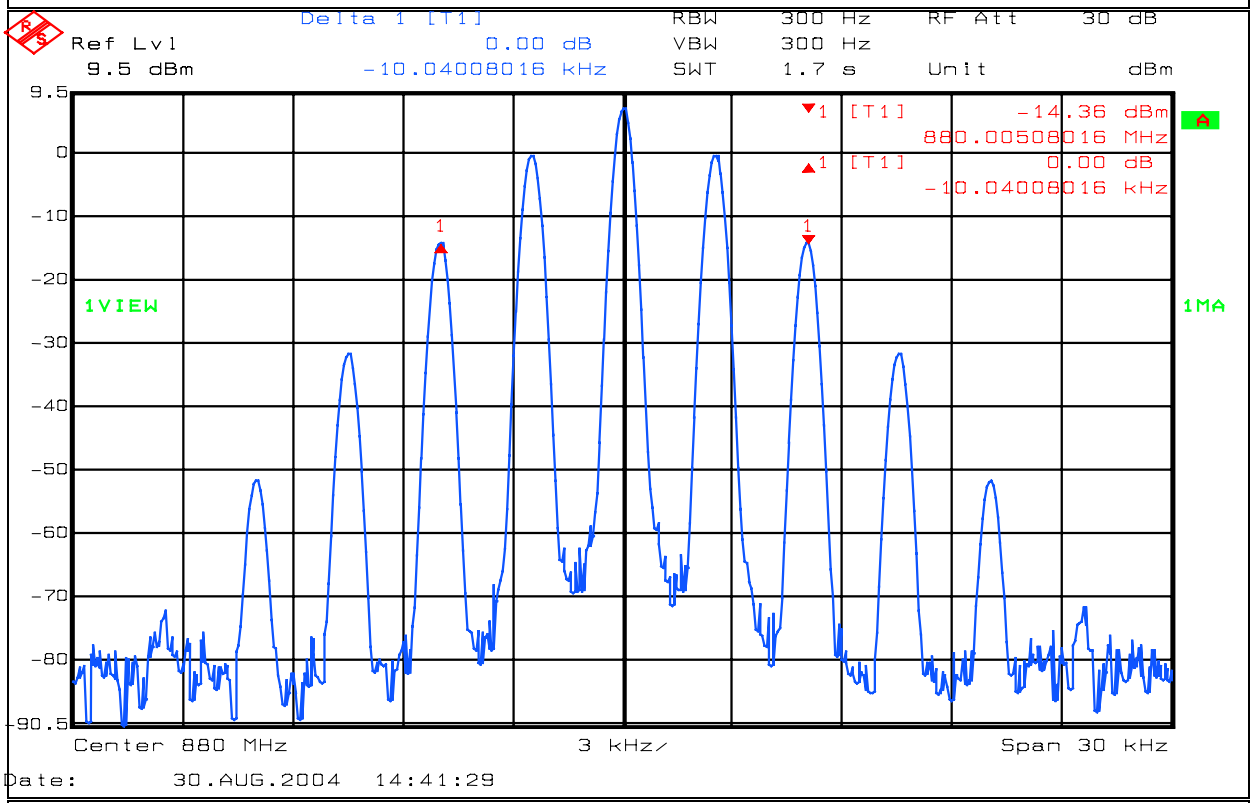
Data Plot — **Occupied Bandwidth**

Page 2 of 2

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **ANALOG INPUT**

Test Data – Occupied Bandwidth

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Data Plot — **Occupied Bandwidth**

Page 1 of 2 — Complete: X — Preliminary:

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

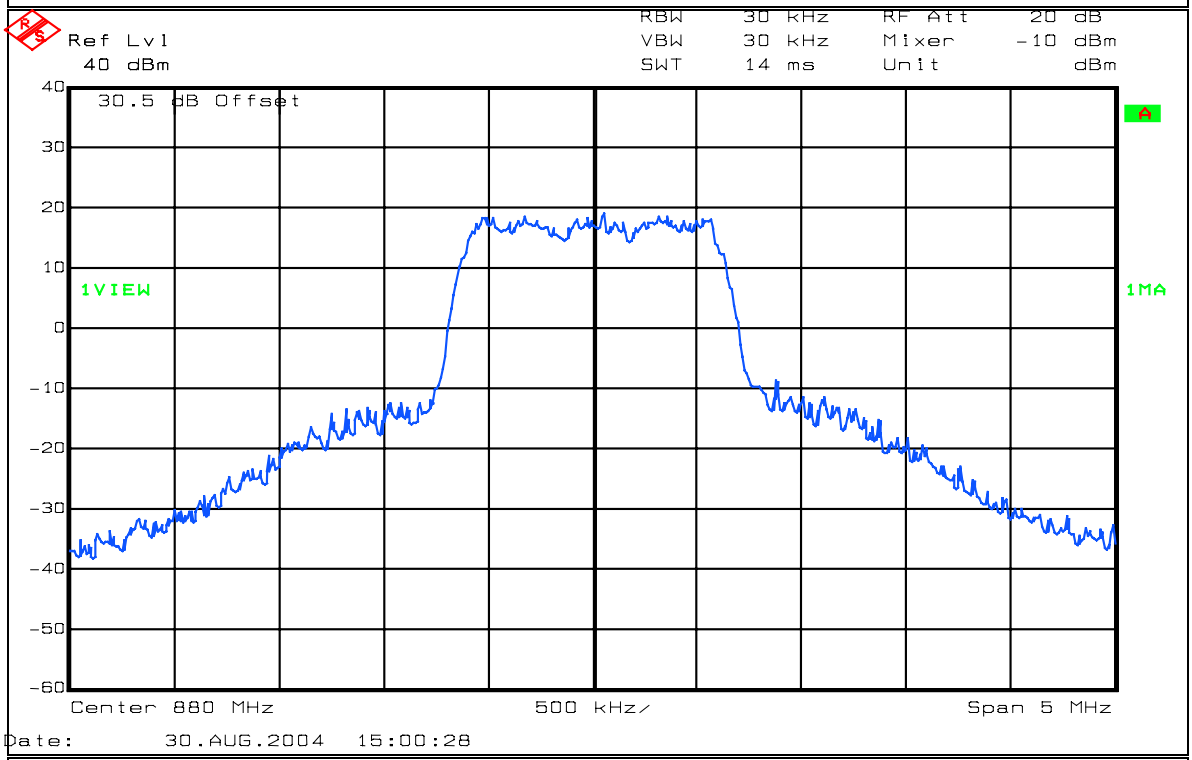
Measurement Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **CDMA OUTPUT**
MAX POWER 31 dBm

Test Data – Occupied Bandwidth

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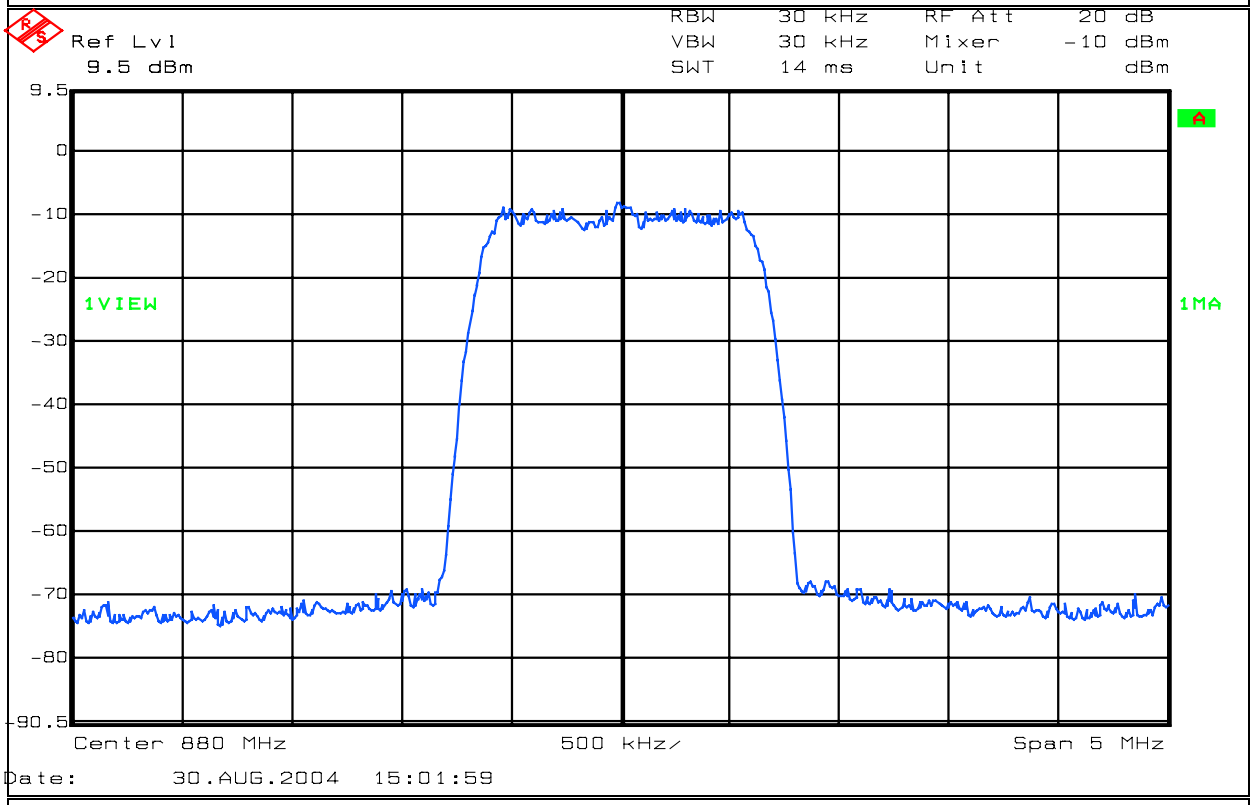
Data Plot **Occupied Bandwidth**

Page 2 of 2

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **CDMA INPUT**

Test Data – Occupied Bandwidth

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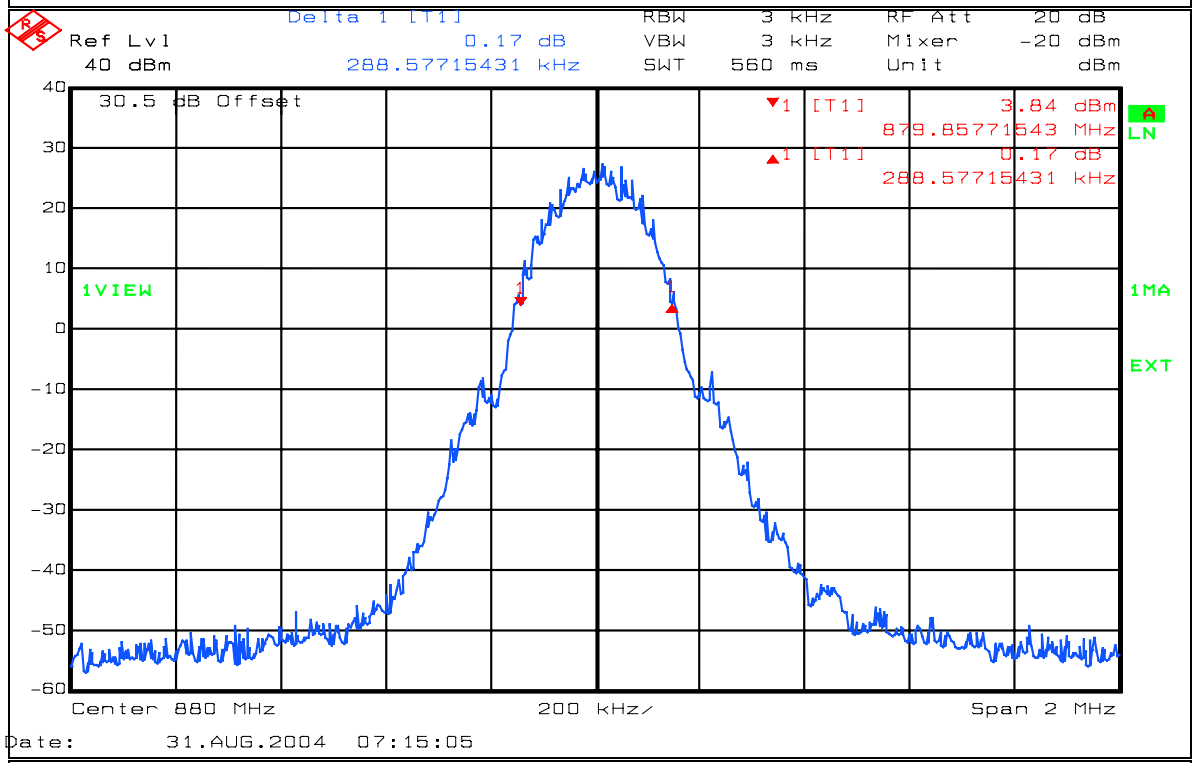
Data Plot — **Occupied Bandwidth**

Page 1 of 2 — Complete: X

Job No.:	4L0570	Date:	8/30/2004	Preliminary:	
Specification:	PT22	Temperature(°C):	25		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
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:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		



Notes: **GSM OUTPUT**
MAX POWER 37 dBm

Test Data – Occupied Bandwidth

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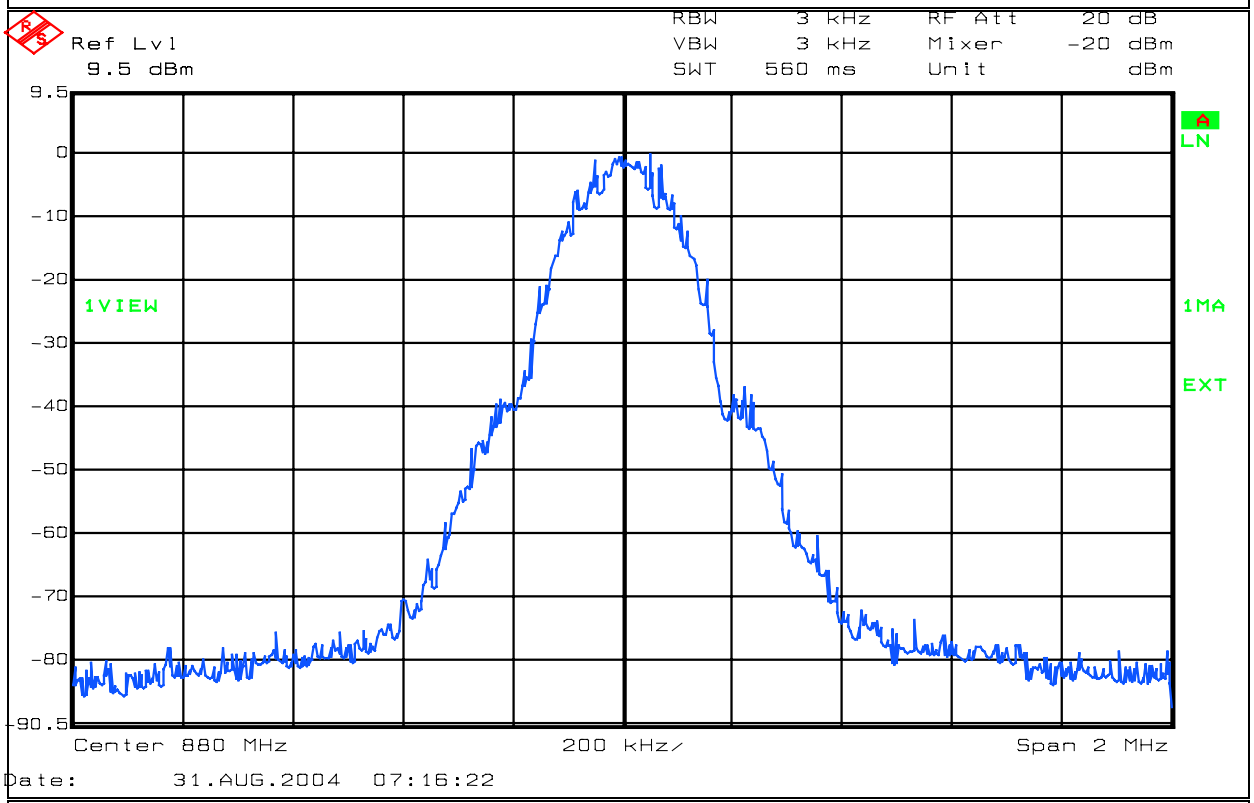
Data Plot — **Occupied Bandwidth**

Page 2 of 2

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: GSM INPUT

Test Data – Occupied Bandwidth

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Data Plot — **Occupied Bandwidth**

Page 1 of 2 — Complete: X — Preliminary:

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

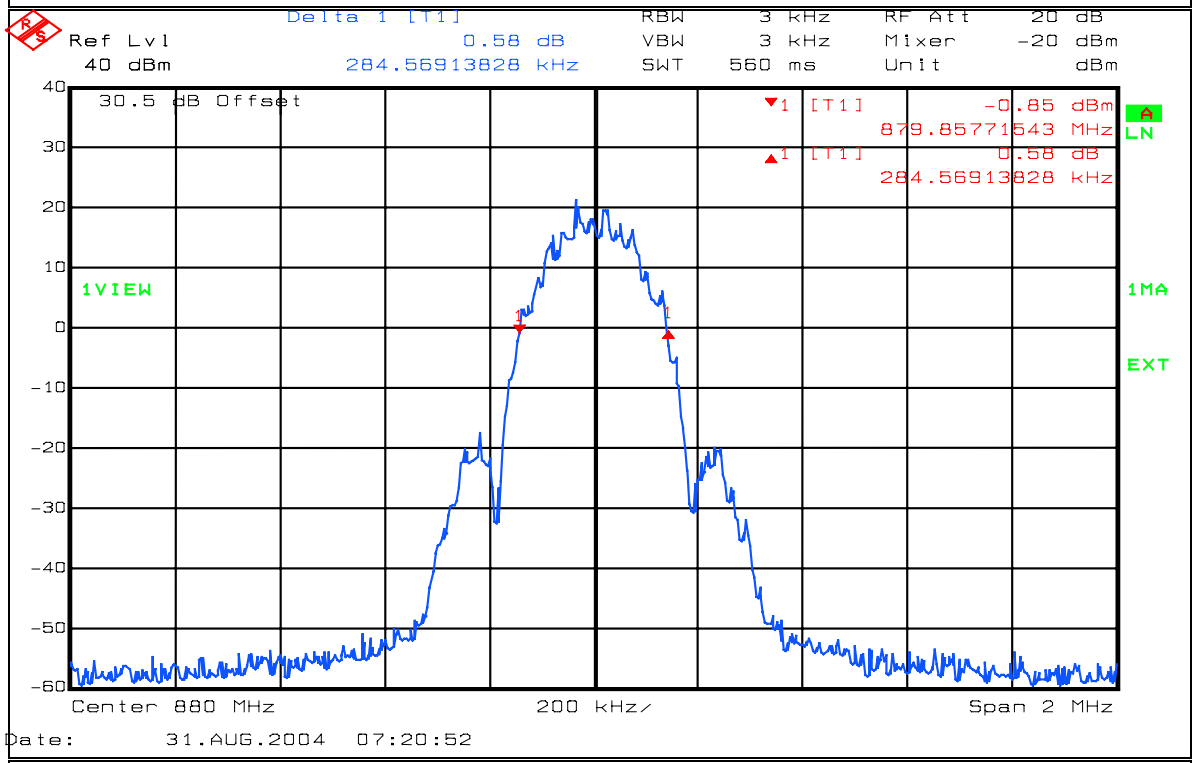
Measurement Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **EDGE OUTPUT**
MAX POWER 33.5 dBm

Test Data – Occupied Bandwidth

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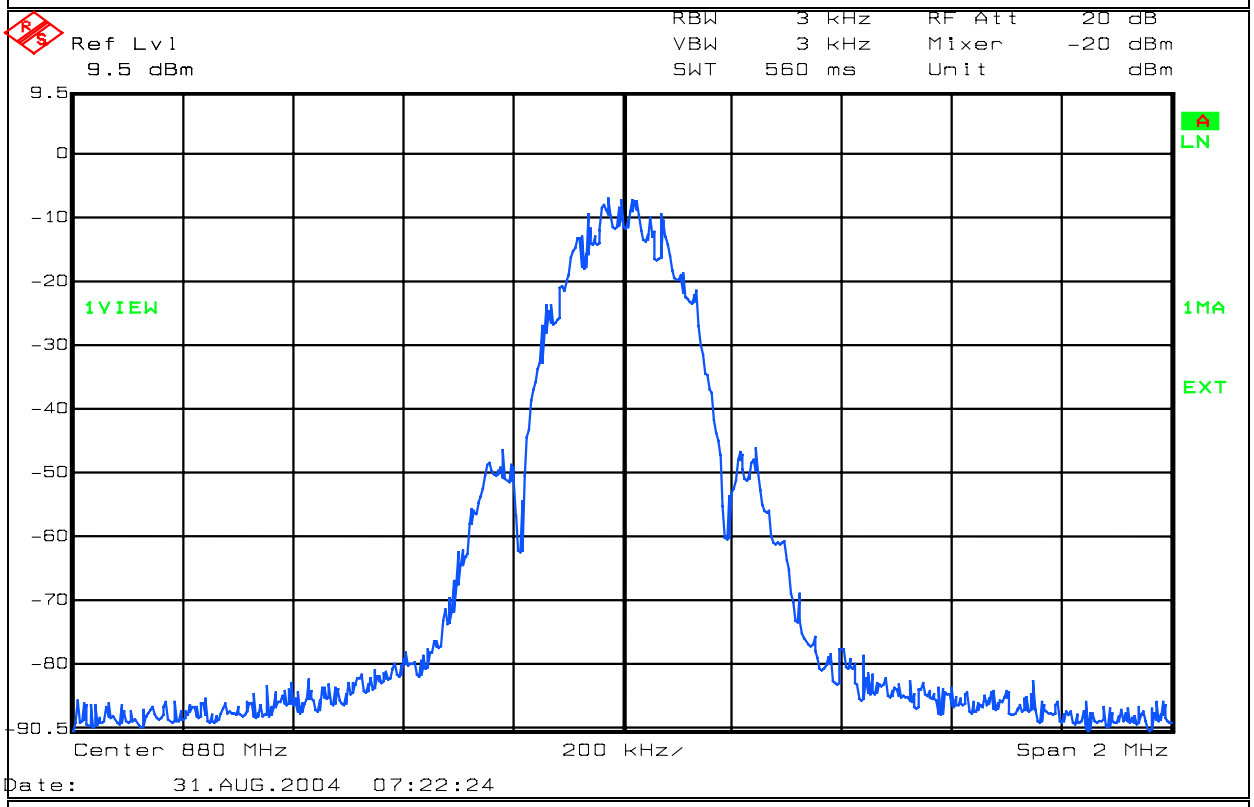
Data Plot — **Occupied Bandwidth**

Page 2 of 2

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **EDGE INPUT**

Test Data – Occupied Bandwidth

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Data Plot — **Occupied Bandwidth**

Page 1 of 2 — Complete: X — Preliminary:

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

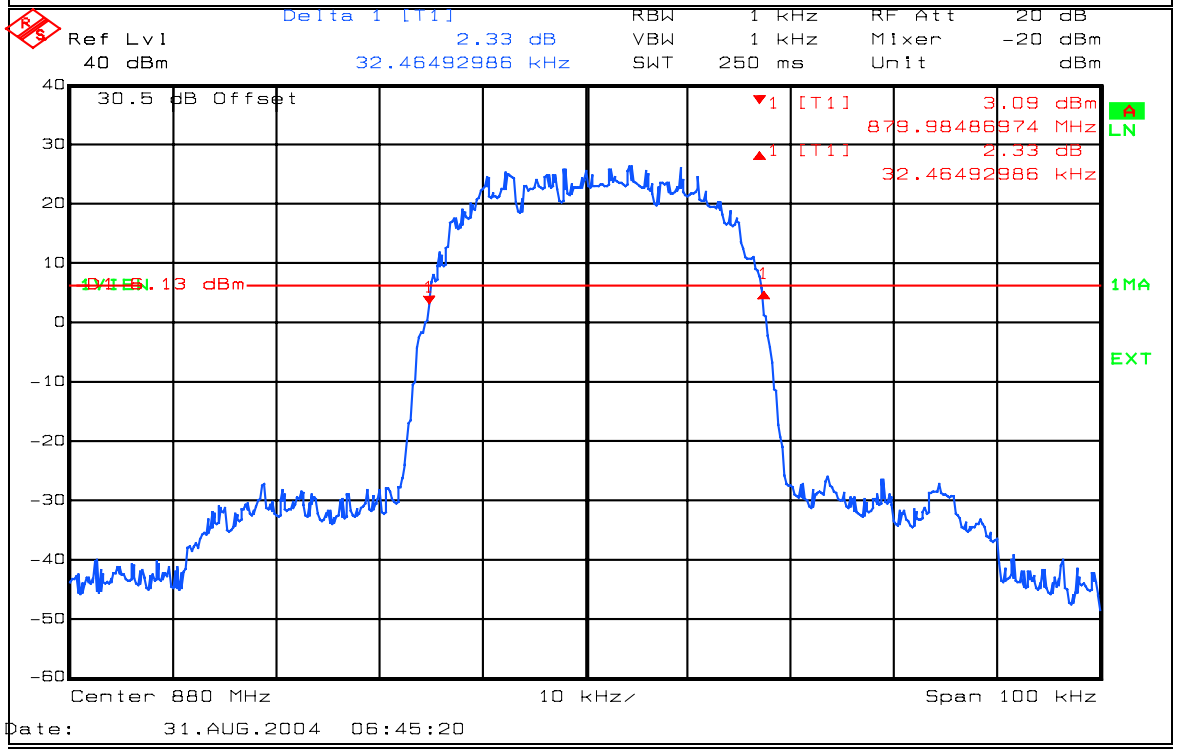
Measurement Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **TDMA OUTPUT**
MAX POWER 34.5 dBm

Test Data – Occupied Bandwidth

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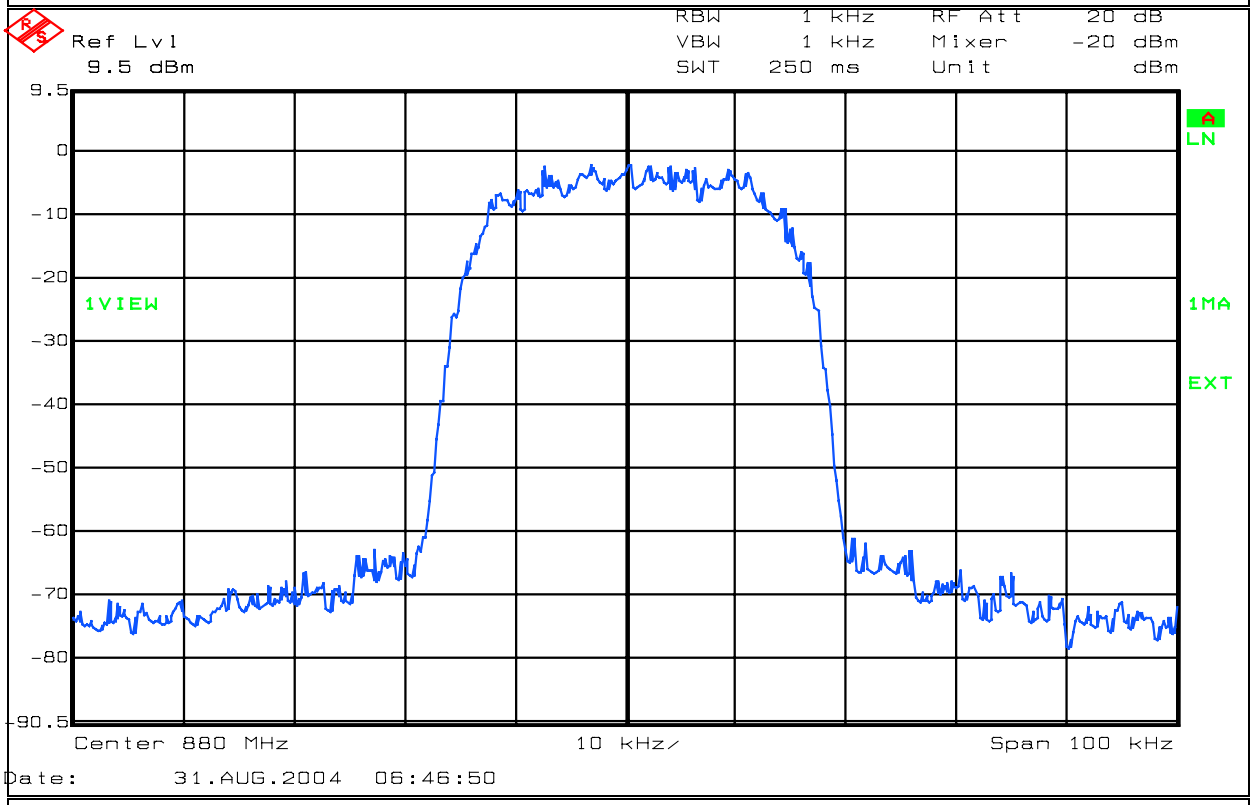
Data Plot — **Occupied Bandwidth**

Page 2 of 2

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **TDMA INPUT**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 8/30/04

Test Results: Complies.

Test Data: See attached plots

Test Data – Spurious Emissions at Antenna Terminals

Dallas Headquarters:
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Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

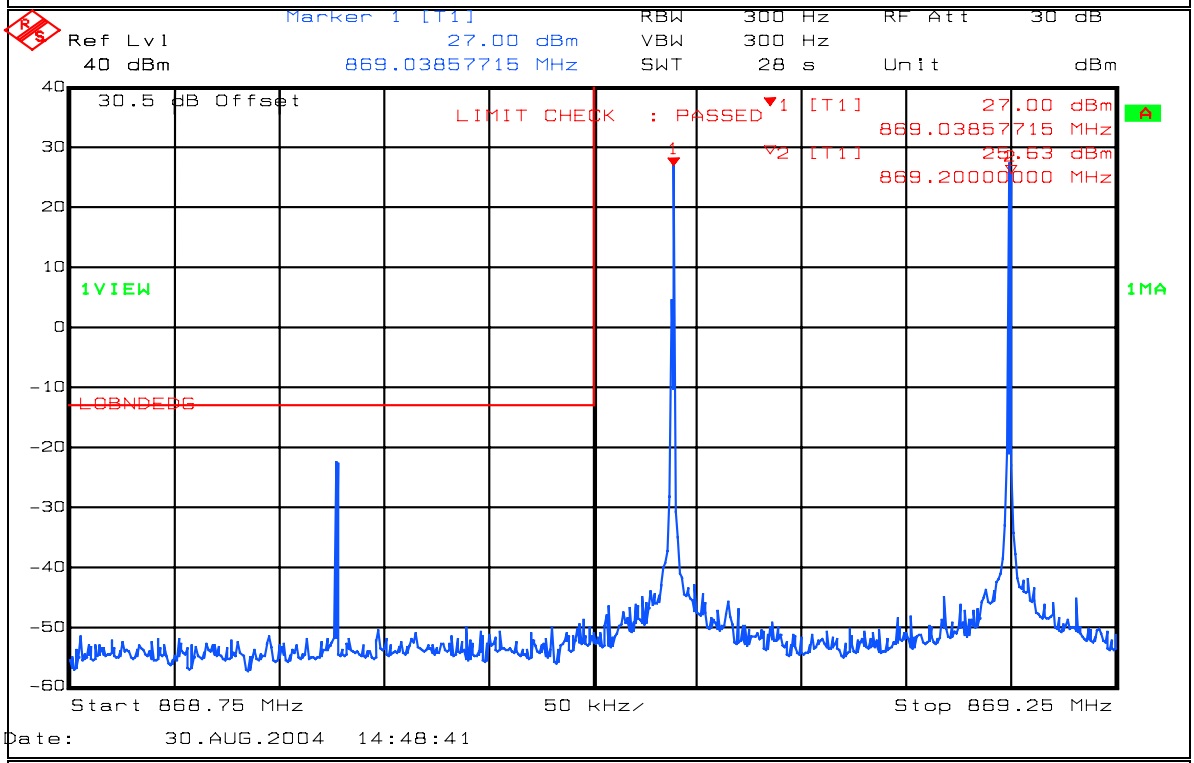
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3 — Complete X

Job No.:	4L0570	Date:	8/30/2004	Preliminary:	
Specification:	PT22	Temperature(°C):	25		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
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:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		



Notes:
LOWER BAND EDGE
2 CHANNELS AT 27 dBm EACH
ANALOG

Test Data – Spurious Emissions at Antenna Terminals

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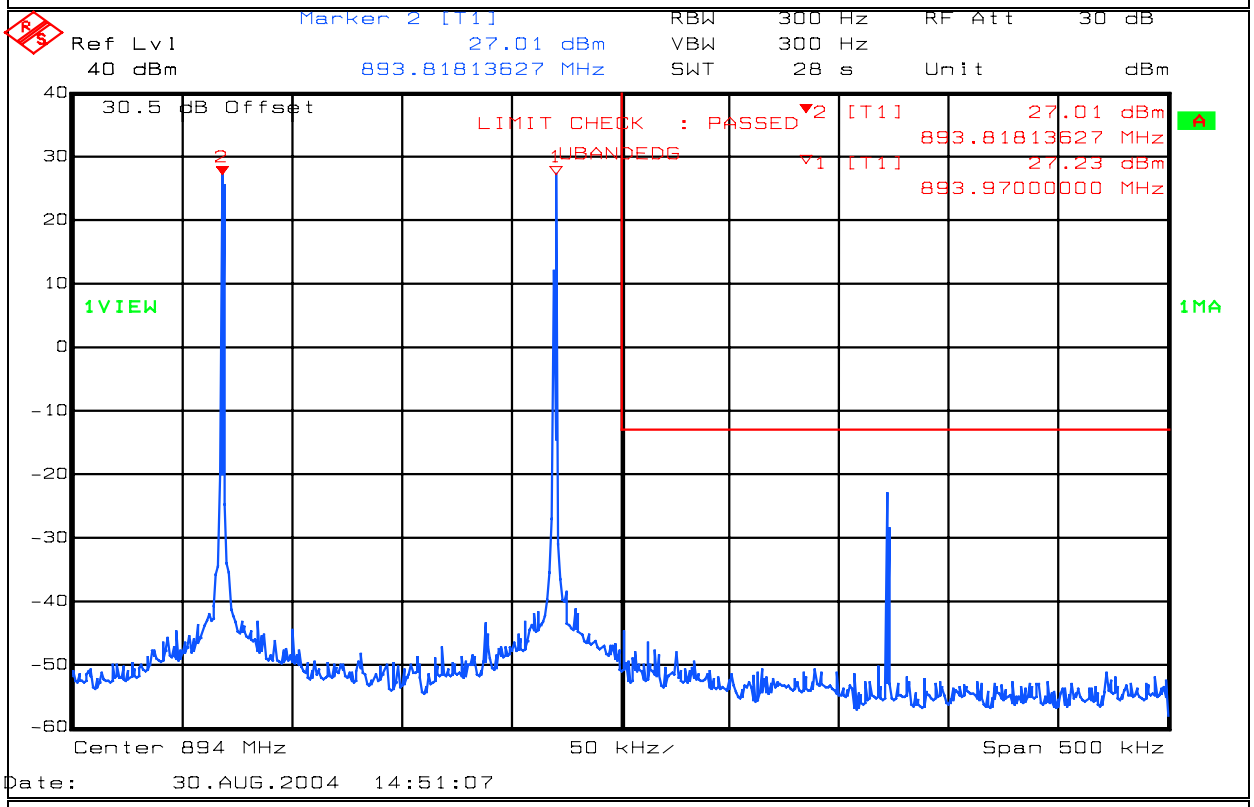
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes:
UPPER BAND EDGE - ANALOG
2 CHANNELS AT 27 dBm EACH
ANALOG

Test Data – Spurious Emissions at Antenna Terminals

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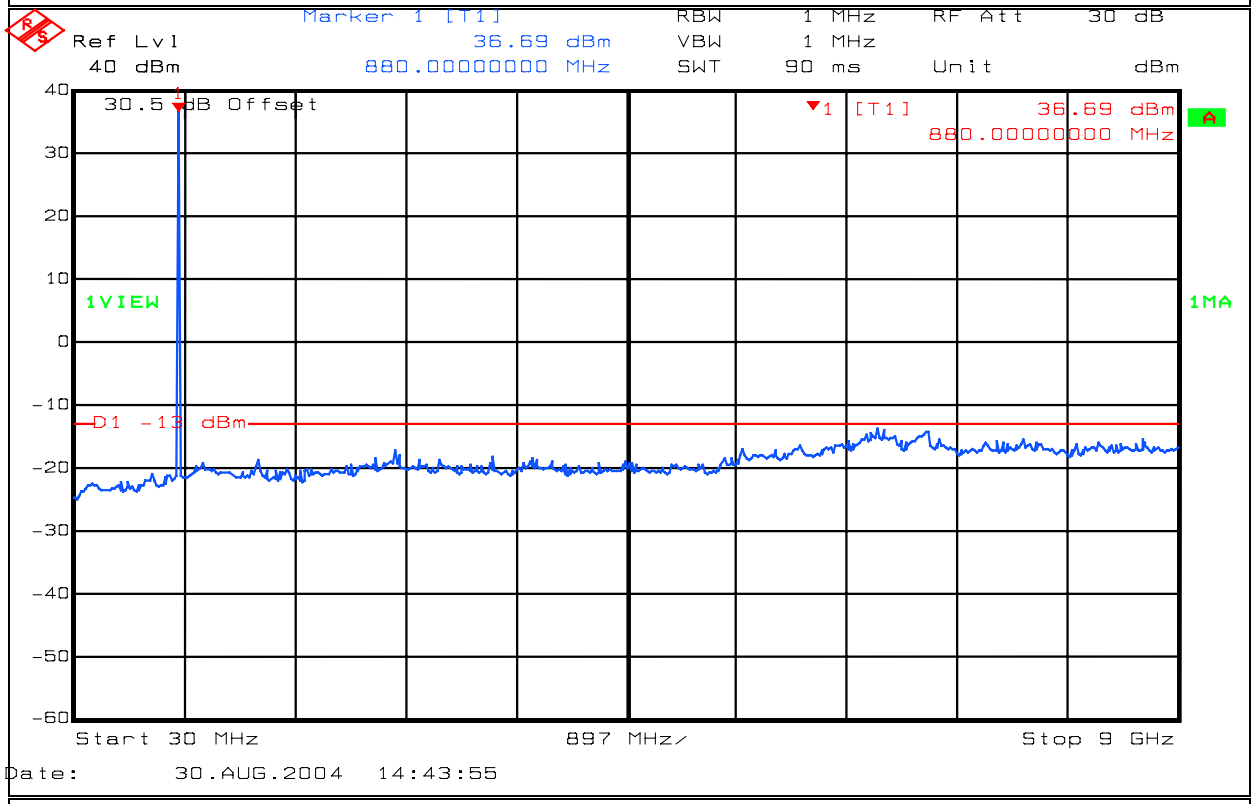
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes:	**TX 880 MHz @ 37 dBm**
	The spectrum was searched in detail. This plot is a true indication of the emissions detected.
	ANALOG

Test Data – Spurious Emissions at Antenna Terminals

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Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3

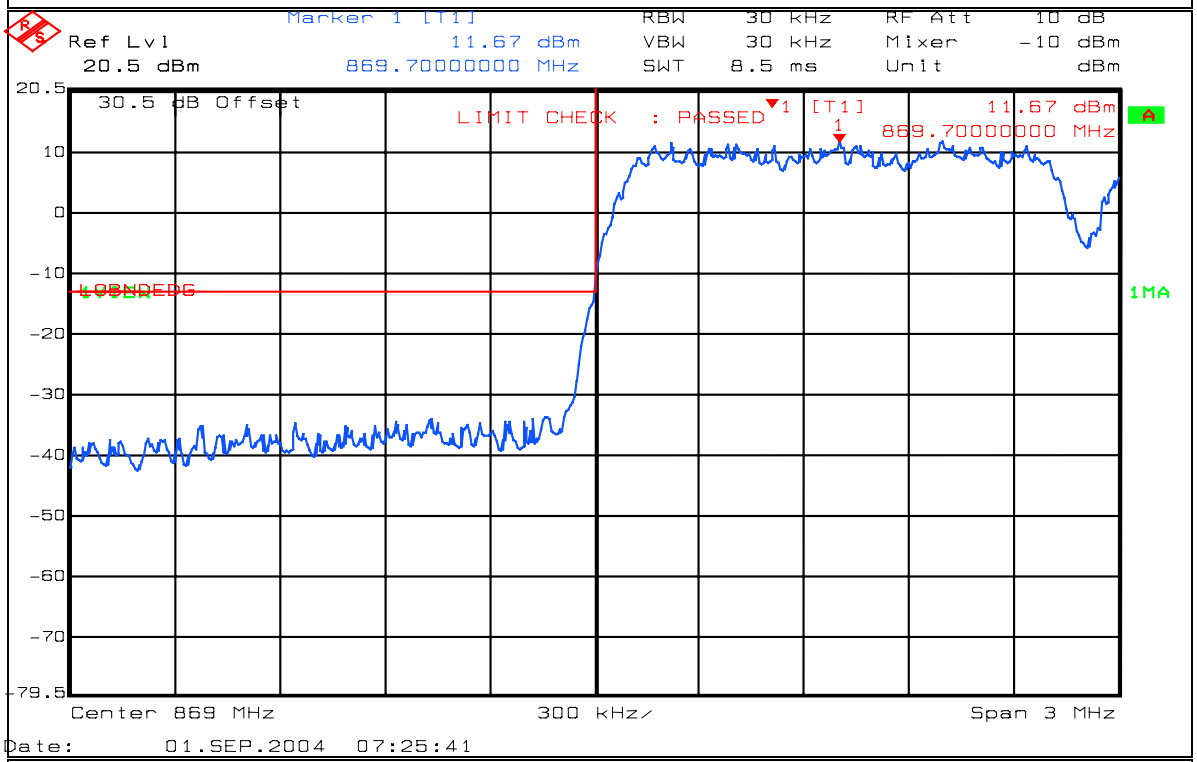
Job No.:	4L0570	Date:	9/1/2004	Complete	X
Specification:	PT22	Temperature(°C):	22	Preliminary:	
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
Sample Number:	1				
Location:	Lab 1	RBW:	30 kHz	Measurement	
Detector Type:	Peak	VBW:	30 kHz	Distance:	NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **LOWER BAND EDGE**
2 CHANNELS AT 24.5 dBm EACH
CDMA

Test Data – Spurious Emissions at Antenna Terminals

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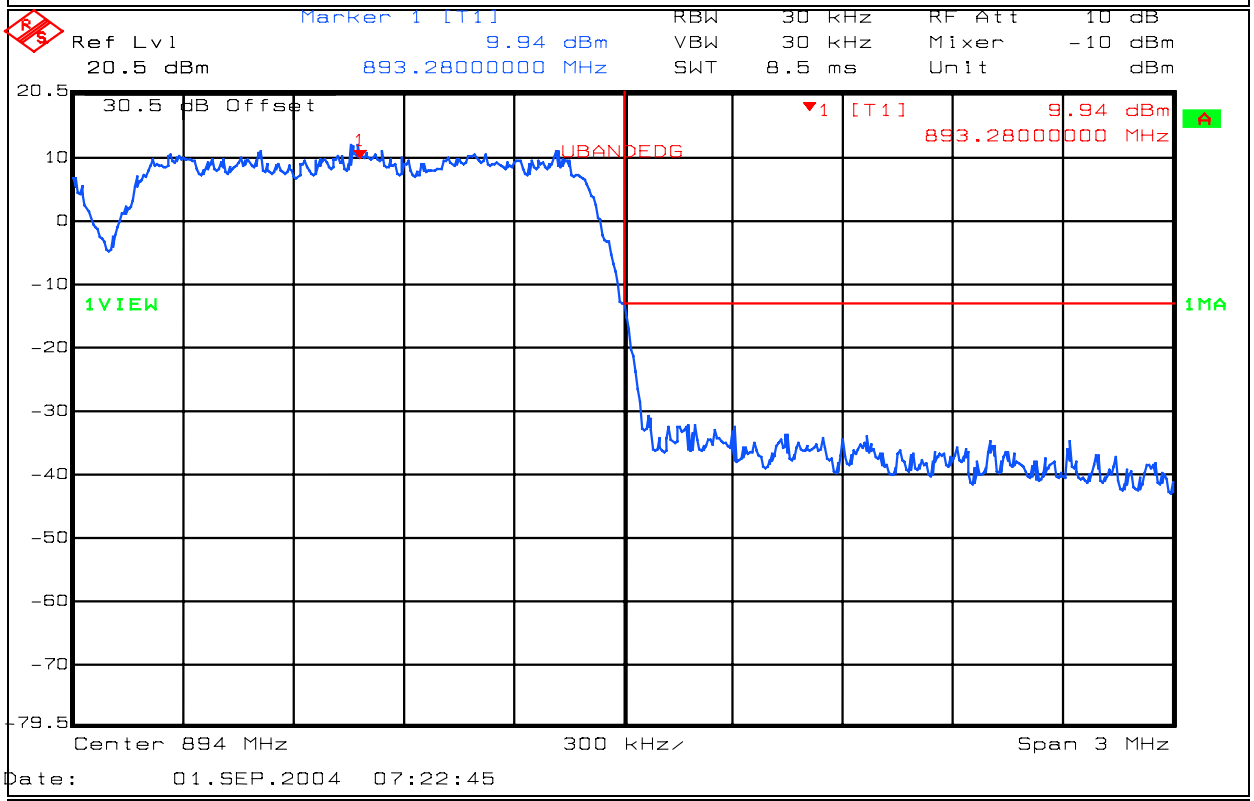
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	4L0570	Date:	9/1/2004
Specification:	PT22	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes:
UPPER BAND EDGE
2 CHANNELS AT 24.5 dBm EACH
CDMA

Test Data – Spurious Emissions at Antenna Terminals

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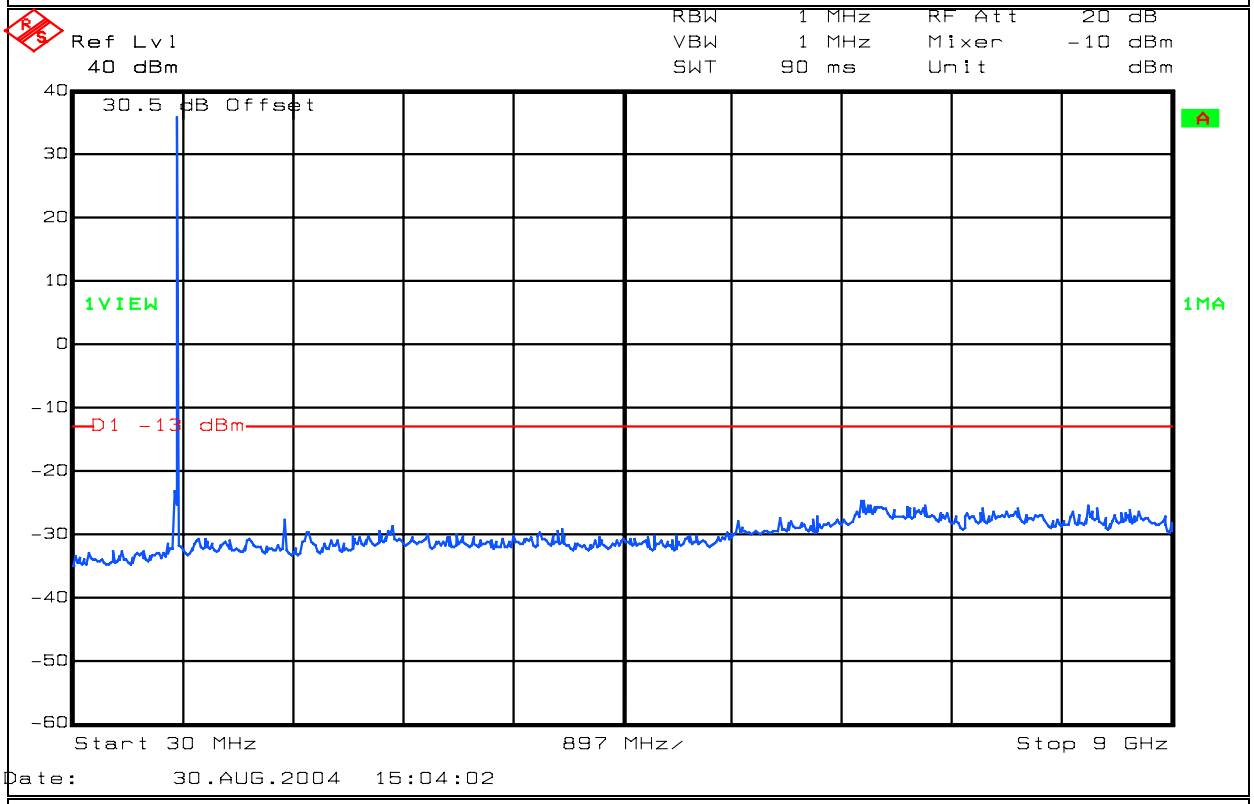
Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	4L0570	Date:	9/1/2004
Specification:	PT22	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **TX 880 MHz @ 31 dBm**

The spectrum was searched in detail. This plot is a true indication of the emissions detected.

Test Data – Spurious Emissions at Antenna Terminals

Dallas Headquarters:
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Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3 — Complete X

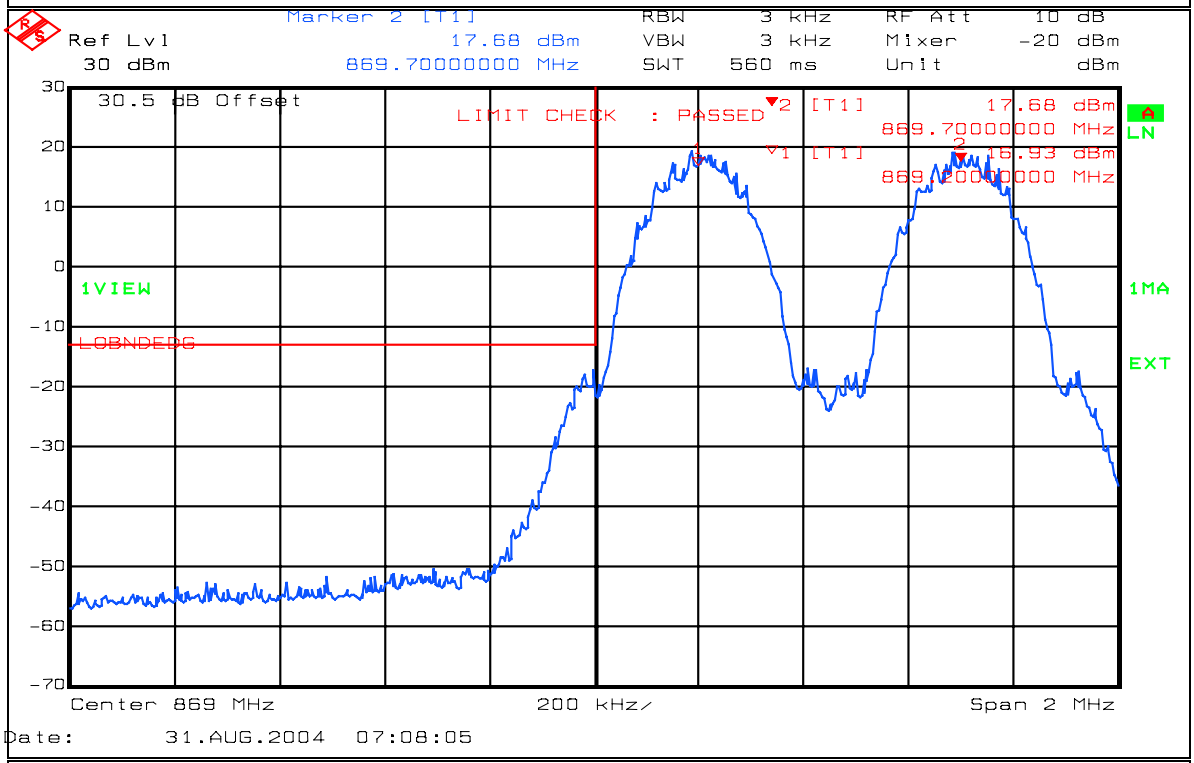
Job No.:	4L0570	Date:	8/30/2004	Preliminary:	
Specification:	PT22	Temperature(°C):	25		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
Sample Number:	1				
Location:	Lab 1	RBW:	30 kHz	Measurement	
Detector Type:	Peak	VBW:	30 kHz	Distance:	NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **LOWER BAND EDGE GSM**
2 CHANNELS AT 27 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals

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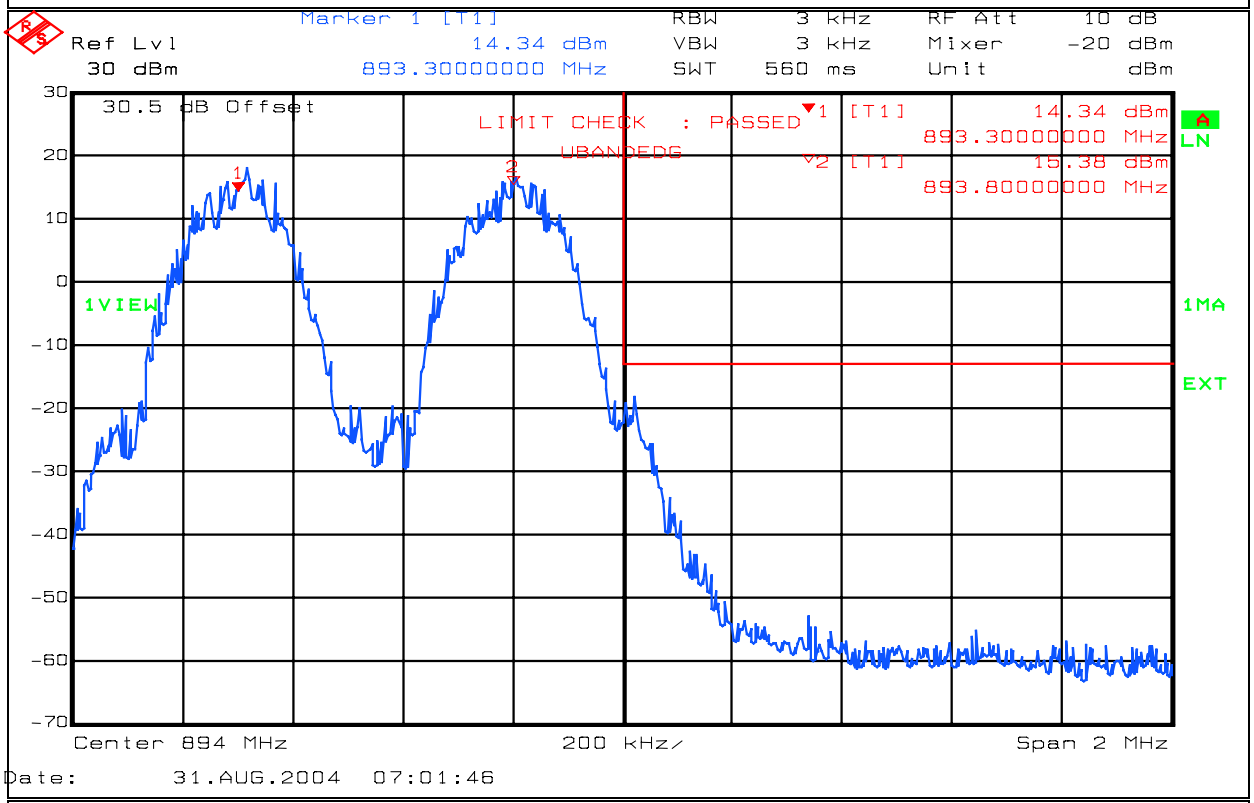
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **UPPER BAND EDGE - GSM**
2 CHANNELS AT 27 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals

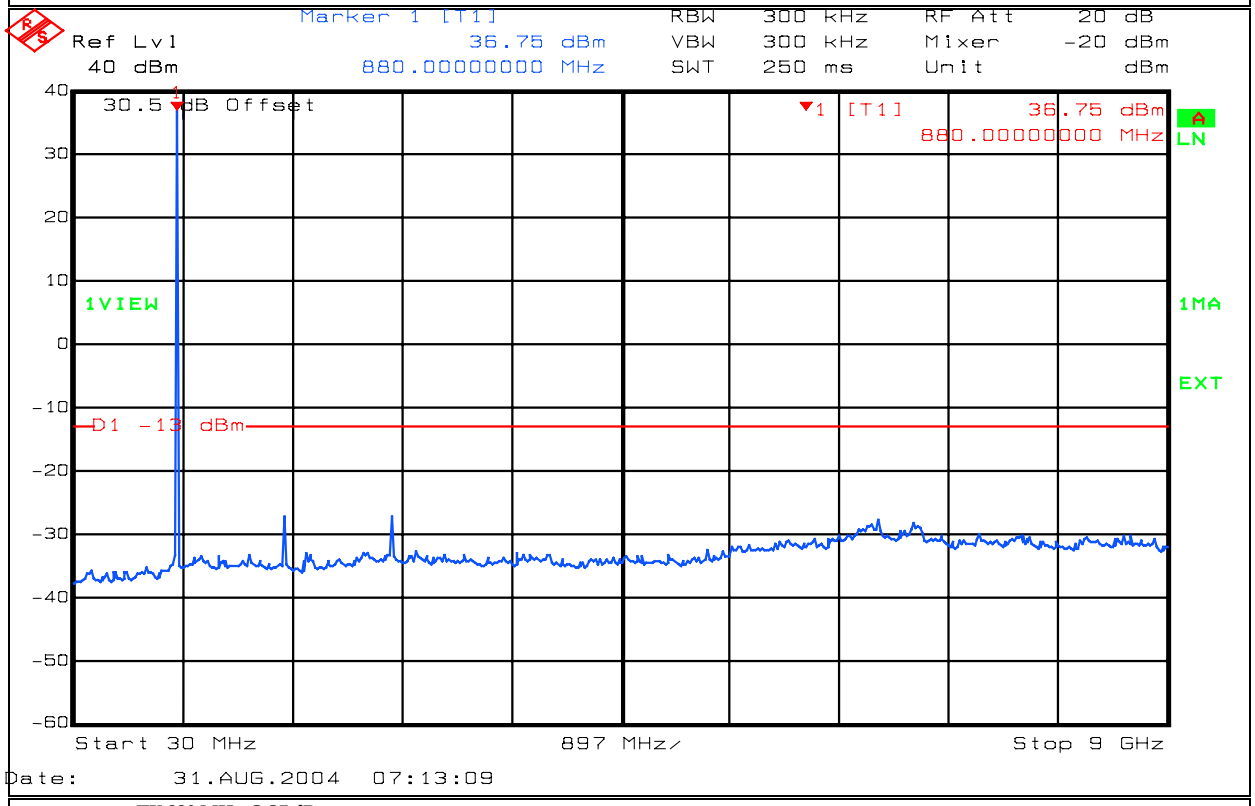
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **TX 880 MHz @ 37 dBm**

The spectrum was searched in detail. This plot is a true indication of the emissions detected.

Test Data – Spurious Emissions at Antenna Terminals

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Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3 — Complete X

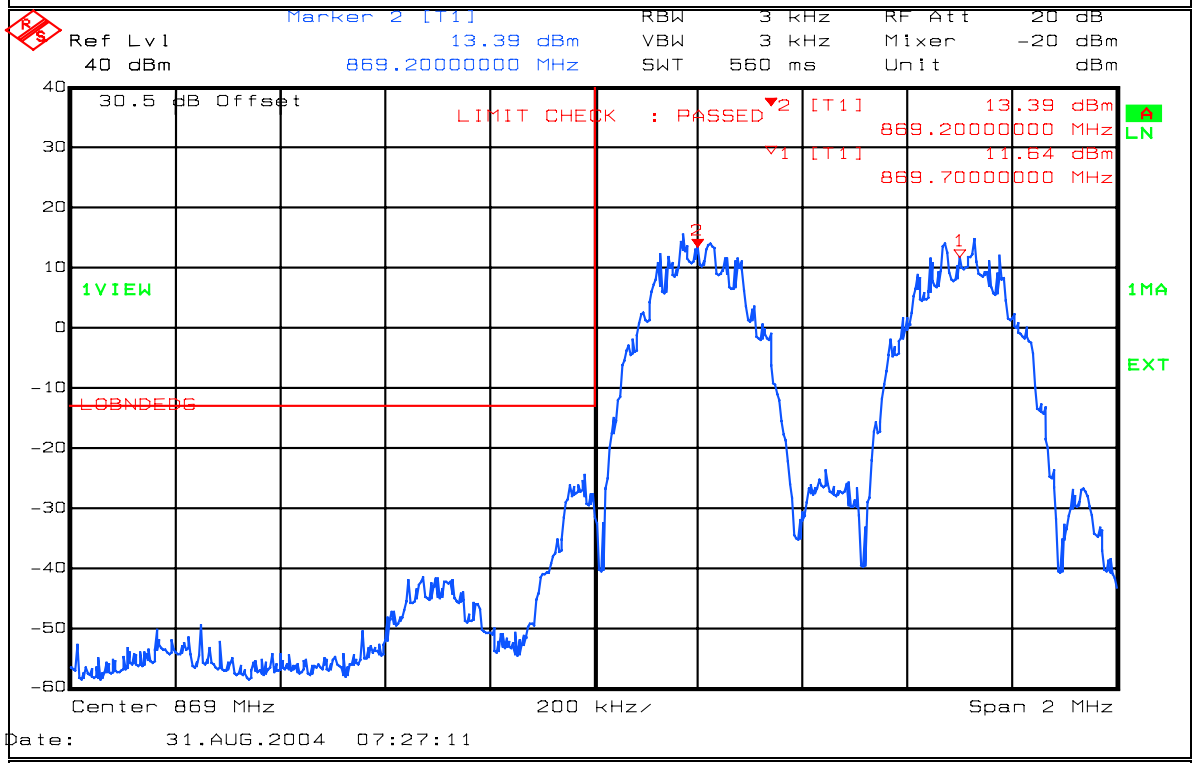
Job No.:	4L0570	Date:	8/30/2004	Preliminary:	
Specification:	PT22	Temperature(°C):	25		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
Sample Number:	1				
Location:	Lab 1	RBW:	Refer to plots	Measurement	
Detector Type:	Peak	VBW:	Refer to plots	Distance:	NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **LOWER BAND EDGE EDGE**
2 CHANNELS AT 25 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals

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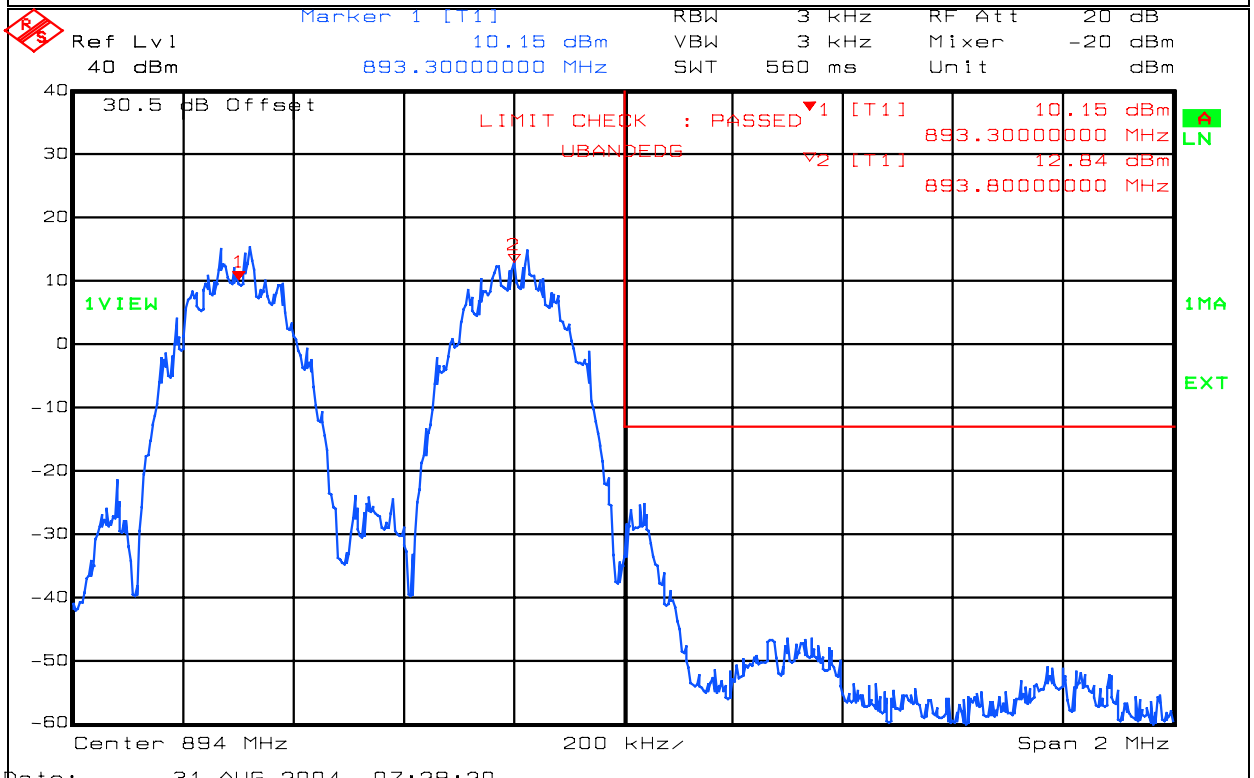
Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **UPPER BAND EDGE - EDGE**
2 CHANNELS AT 25 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals

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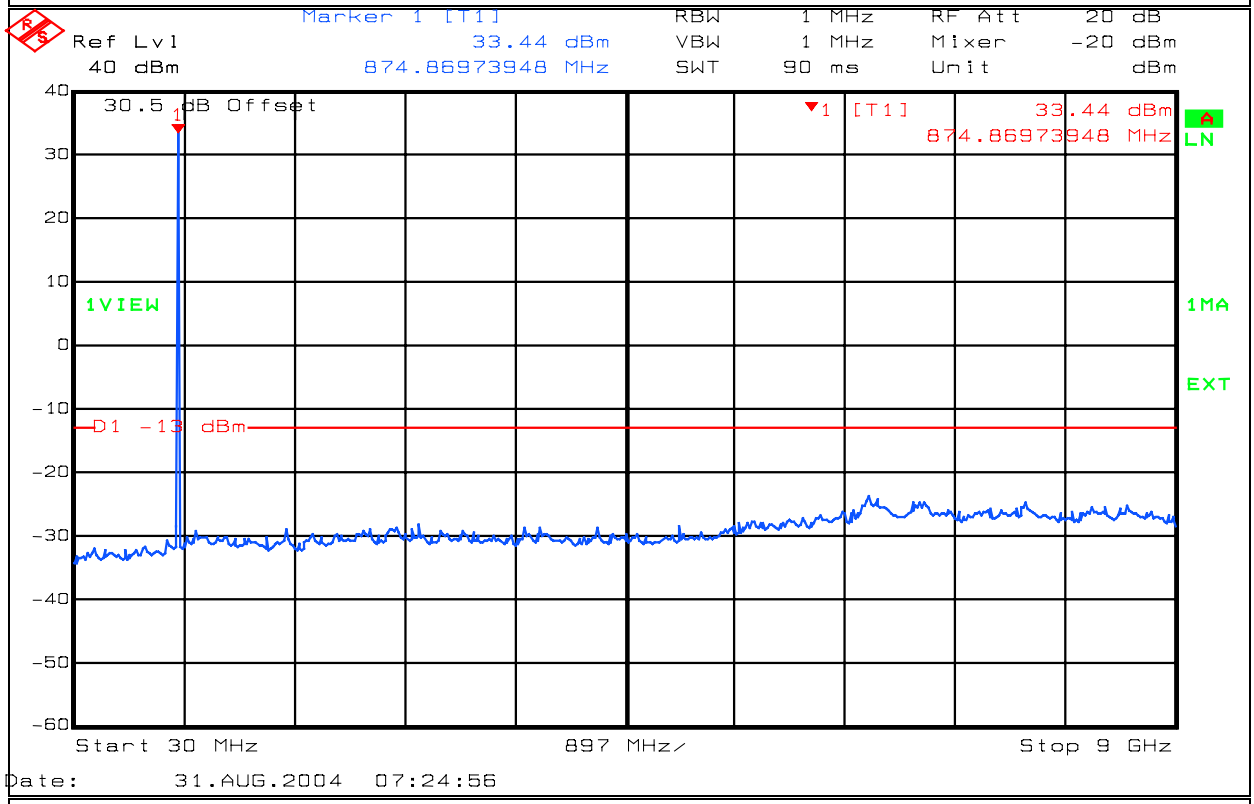
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes: **TX 880 MHz @ 33.5 dBm**

The spectrum was searched in detail. This plot is a true indication of the emissions detected.

Test Data – Spurious Emissions at Antenna Terminals

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Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3 — Complete X

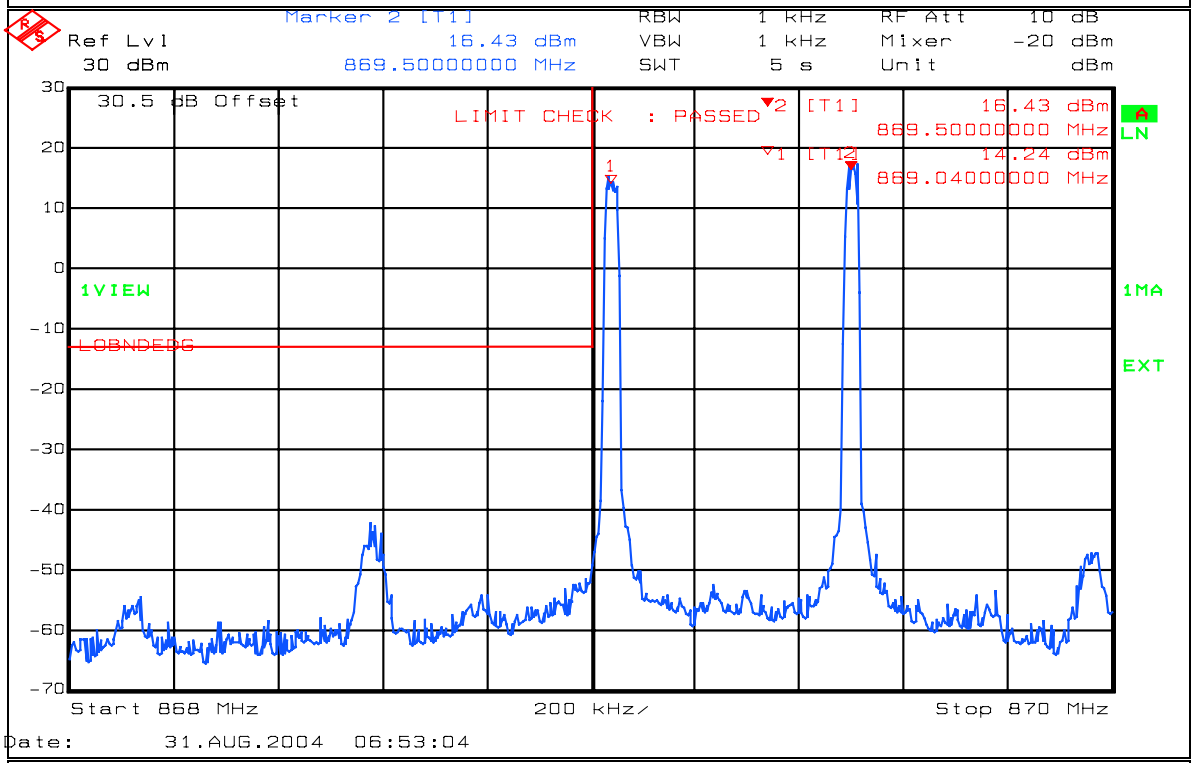
Job No.:	4L0570	Date:	8/30/2004	Preliminary:	
Specification:	PT22	Temperature(°C):	25		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	CELL BAND AMPLIFIER				
Configuration:	TX				
Sample Number:	1				
Location:	Lab 1	RBW:	Refer to plots	Measurement	
Detector Type:	Peak	VBW:	Refer to plots	Distance:	NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1065	Cable #4:	
Attenuator #2:	1604	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes:
LOWER BAND EDGE
2 CHANNELS AT 25.5 dBm EACH
TDMA

Test Data – Spurious Emissions at Antenna Terminals

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Lewisville, TX 75057
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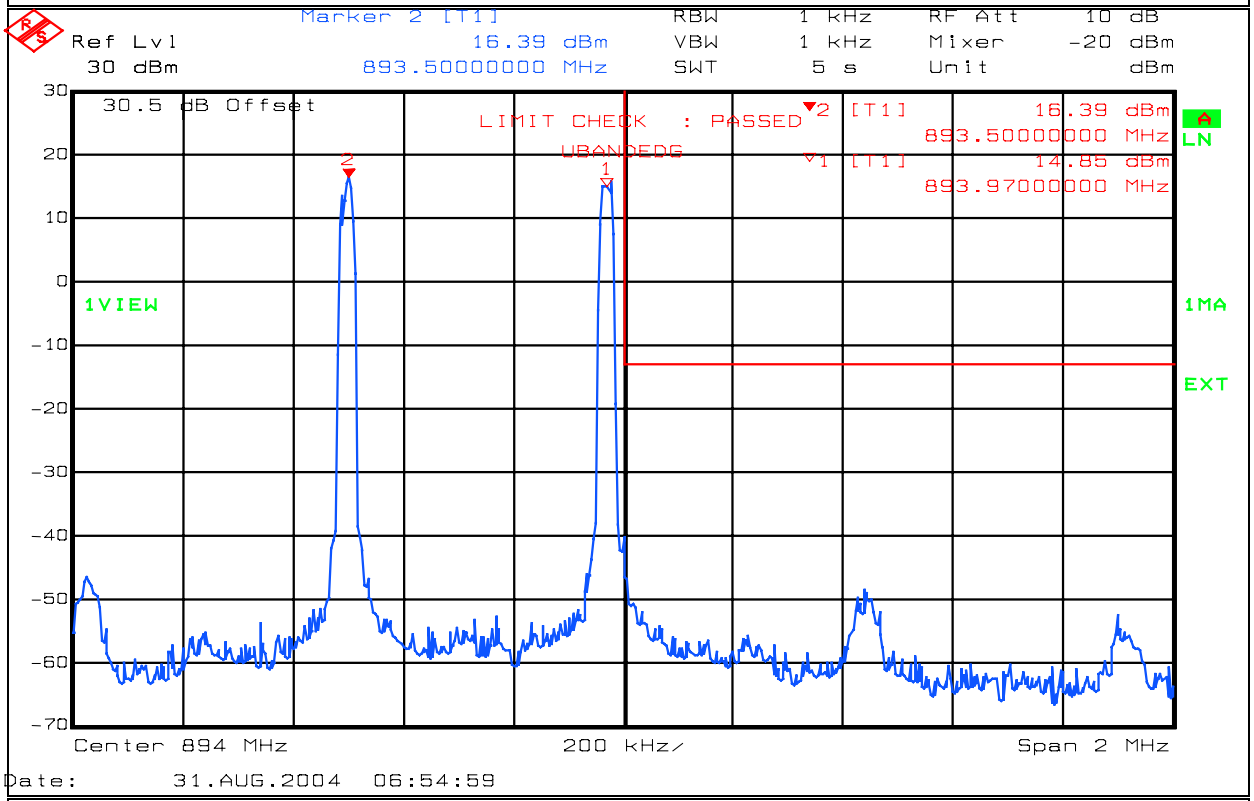
Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes:
UPPER BAND EDGE - TDMA
2 CHANNELS AT 25.5 dBm EACH
TDMA

Test Data – Spurious Emissions at Antenna Terminals

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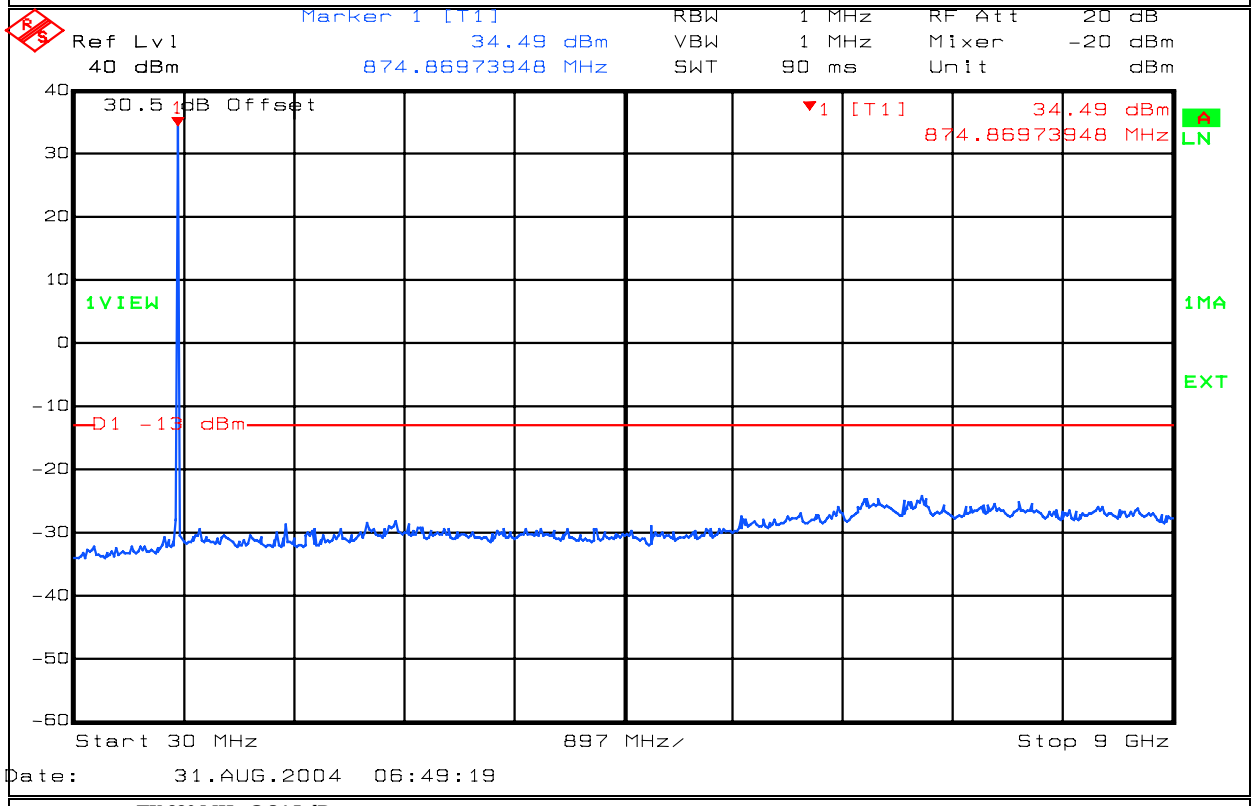
Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	4L0570	Date:	8/30/2004
Specification:	PT22	Temperature(°C):	25
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	CELL BAND AMPLIFIER		
Configuration:	TX		



Notes:	**TX 880 MHz @ 34.5 dBm**
	The spectrum was searched in detail. This plot is a true indication of the emissions detected.
	TDMA

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: Brian Boyea	DATE: 8/31/04

Test Results: Complies.

Test Data: There were no emissions detected within 20 dB of the specification of -13 dBm. The spectrum was searched to the 10th harmonic of the carrier (880 MHz) with the amplifier operating at full rated power.

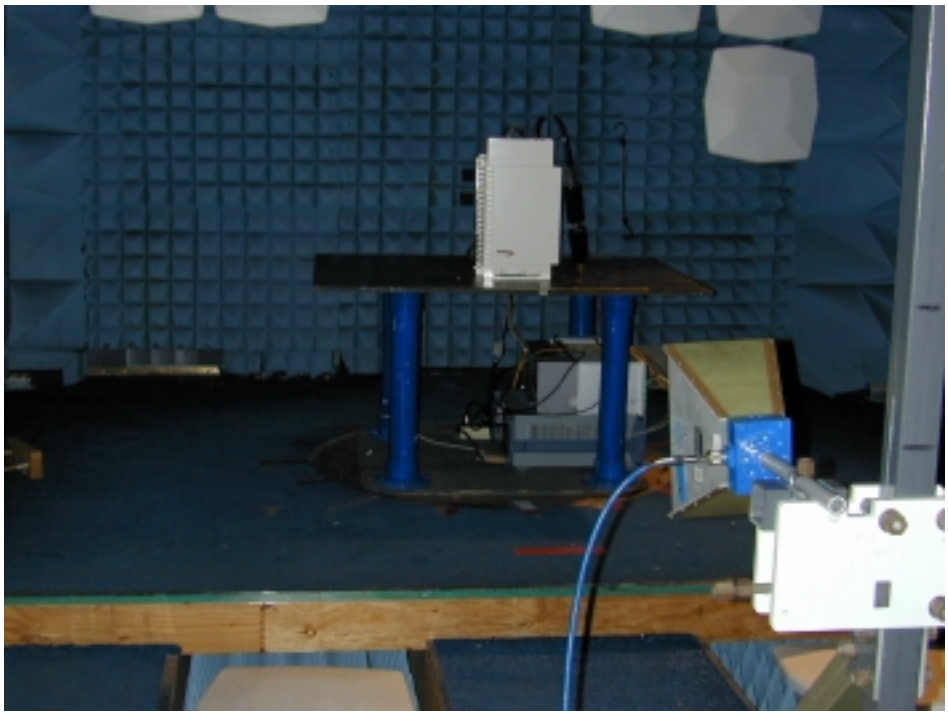
Equipment Used: 1304-1016-1464-1484-1485

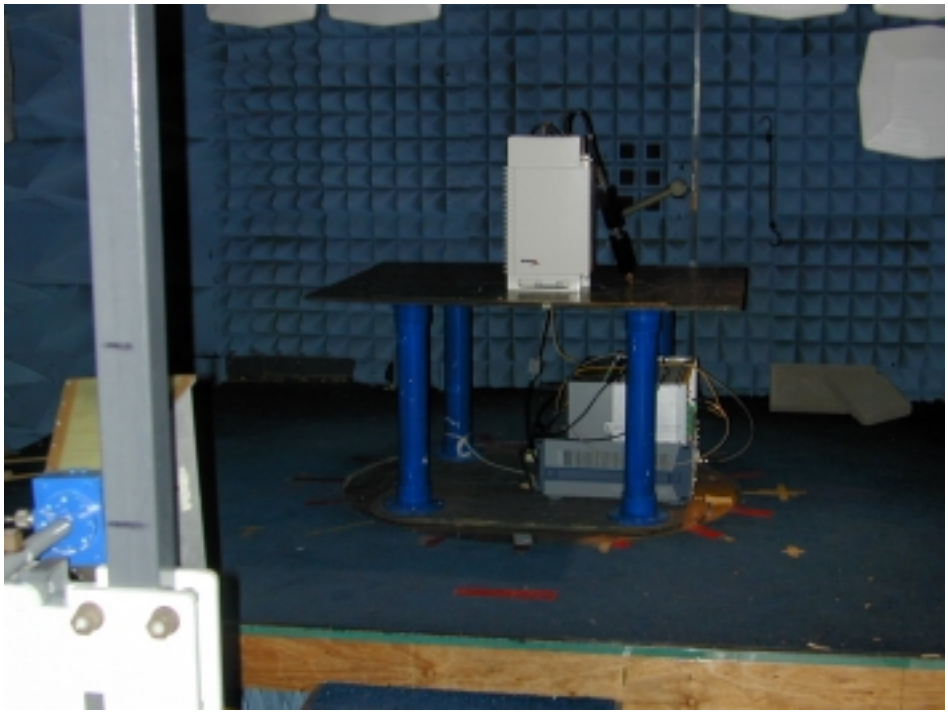
Measurement Uncertainty: +/- 1.7 dB

Temperature: 25 °C

Relative Humidity: 40 %

Test Setup Photos





Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	07/30/04	07/31/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/02/04	08/02/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A

ANNEX A - TEST DETAILS

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

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 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.

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: Occupied Bandwidth (Voice & SAT) PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least 117 log (f_d/12)

(ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least 100 log (f_d/11) dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz
VBW: ≥ RBW
Span: 100 kHz
Sweep: Auto

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer
AF1 frequency: 6 kHz
AF1 level: sufficient to produce 2 kHz deviation
AF2 frequency: 2.5 kHz
AF2 level: sufficient to produce 12 kHz deviation.

NAME OF TEST: Occupied Bandwidth (WB Data)	**PARA. NO.: 2.1049**

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 300 Hz
VBW: ≥ RBW
Span: 200 kHz
Sweep: Auto

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer
AF1 frequency: 10 kHz, random bit sequence
AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (ST)	**PARA. NO.: 2.1049**

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 300 Hz
VBW: ≥ RBW
Span: 200 kHz
Sweep: Auto

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer
AF1 frequency: 10 kHz tone
AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (Digital Modulation)	**PARA. NO.: 2.1049**

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)
VBW: ≥ RBW
Span: As required
Sweep: Auto

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer

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

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 30 kHz (AMPS). As required for digital modulations.
VBW: ≥ RBW
Start Frequency: 0 MHz
Stop Frequency: 10 GHz
Sweep: Auto

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

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Test Method:

The maximum field strength of the spurious emission is measured at a distance of 3 meters. The device under test is then replaced with a substitution antenna of known gain with respect to a ¼ wave dipole antenna. A calibrated signal source is used to feed the substitution antenna. The rf level to the substitution antenna is adjusted to repeat the previously measured field strength. The rf input level to the substitution antenna is the effective radiated power of the spurious emission after any correction for substitution antenna gain against a ¼ wave dipole.

The spectrum is searched to 10 GHz.

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

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Table C-1

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

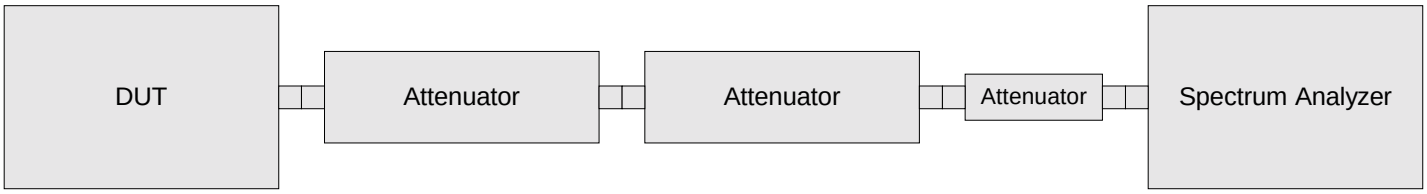
Method Of Measurement:

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.

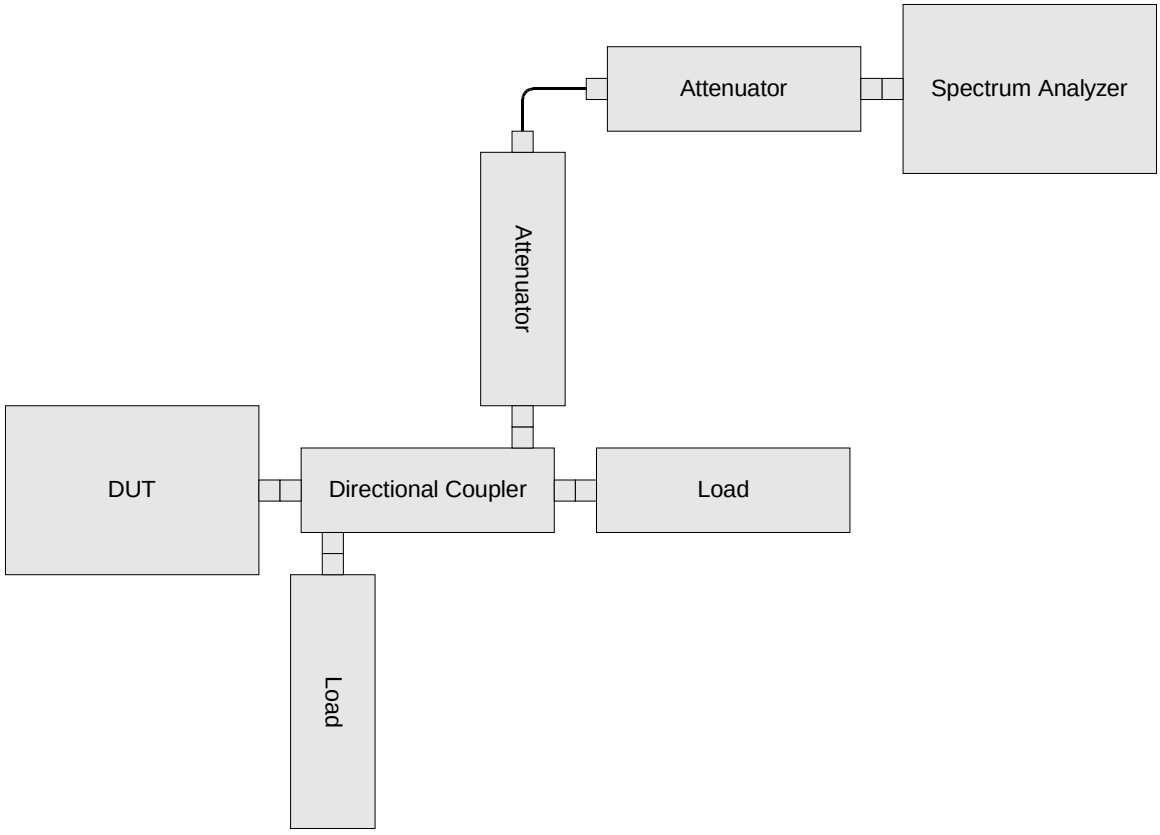
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30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

ANNEX B - TEST DIAGRAMS

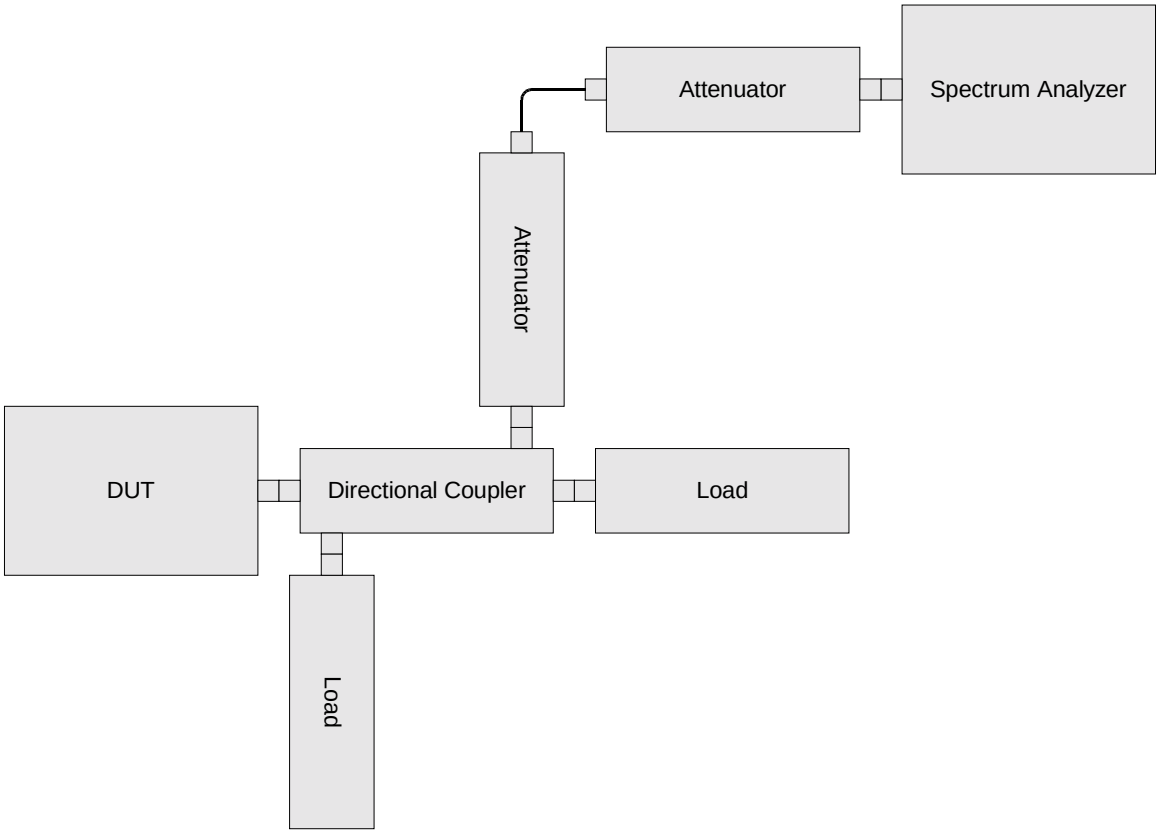
Para. No. 2.1046 - R.F. Power Output

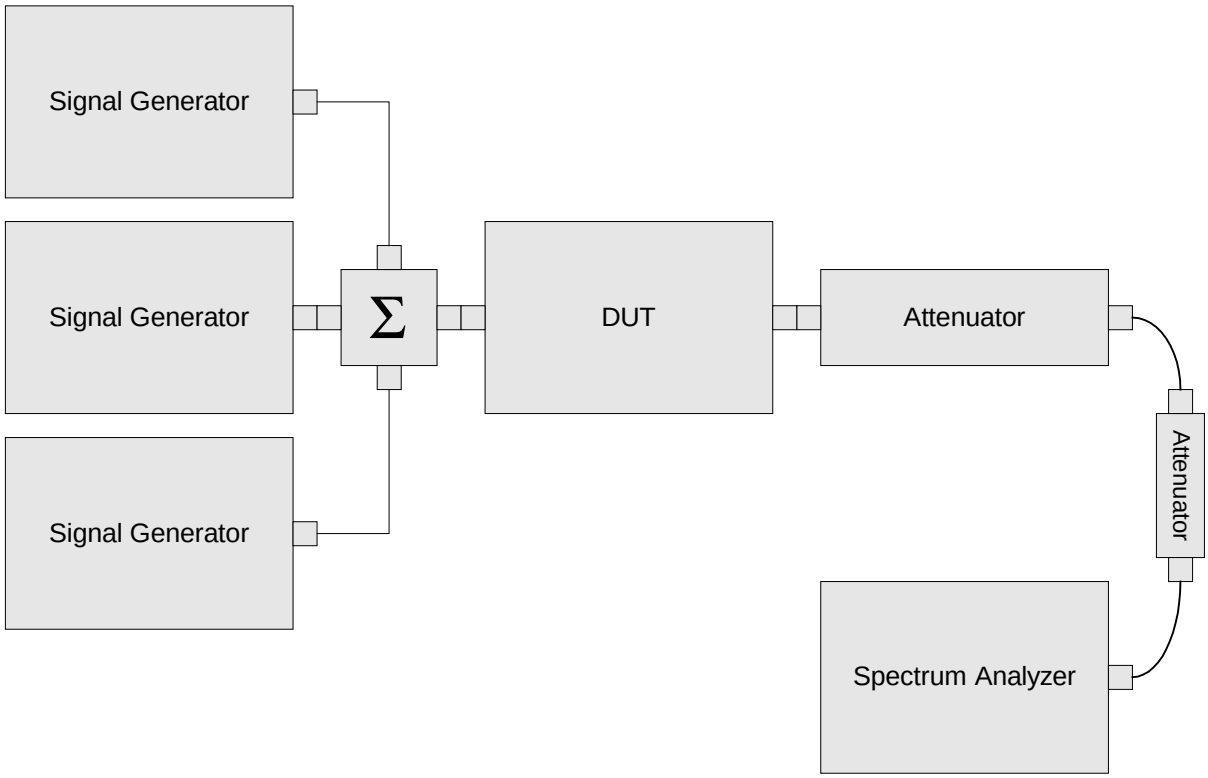


Para. No. 2.1049 - Occupied Bandwidth

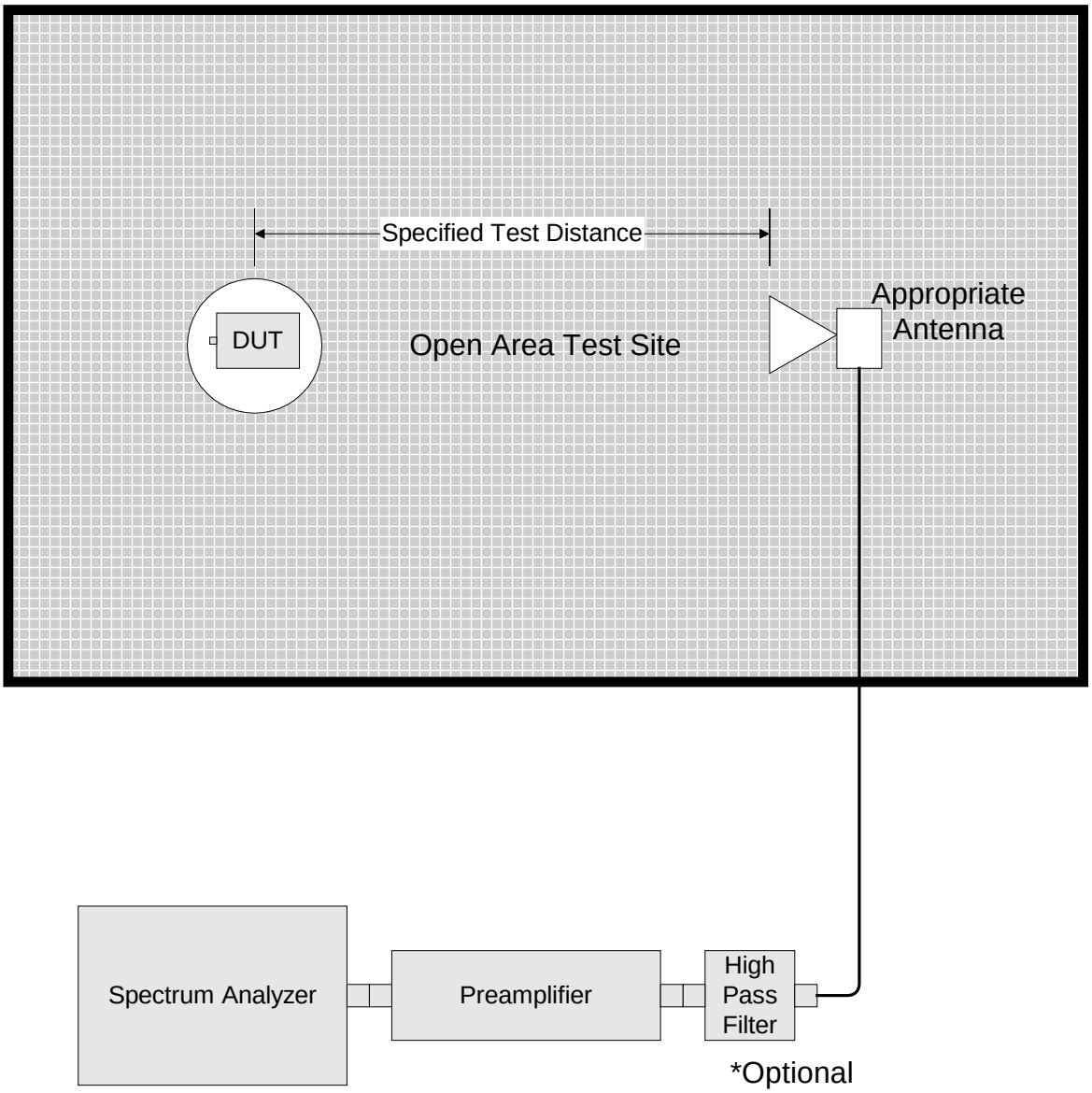


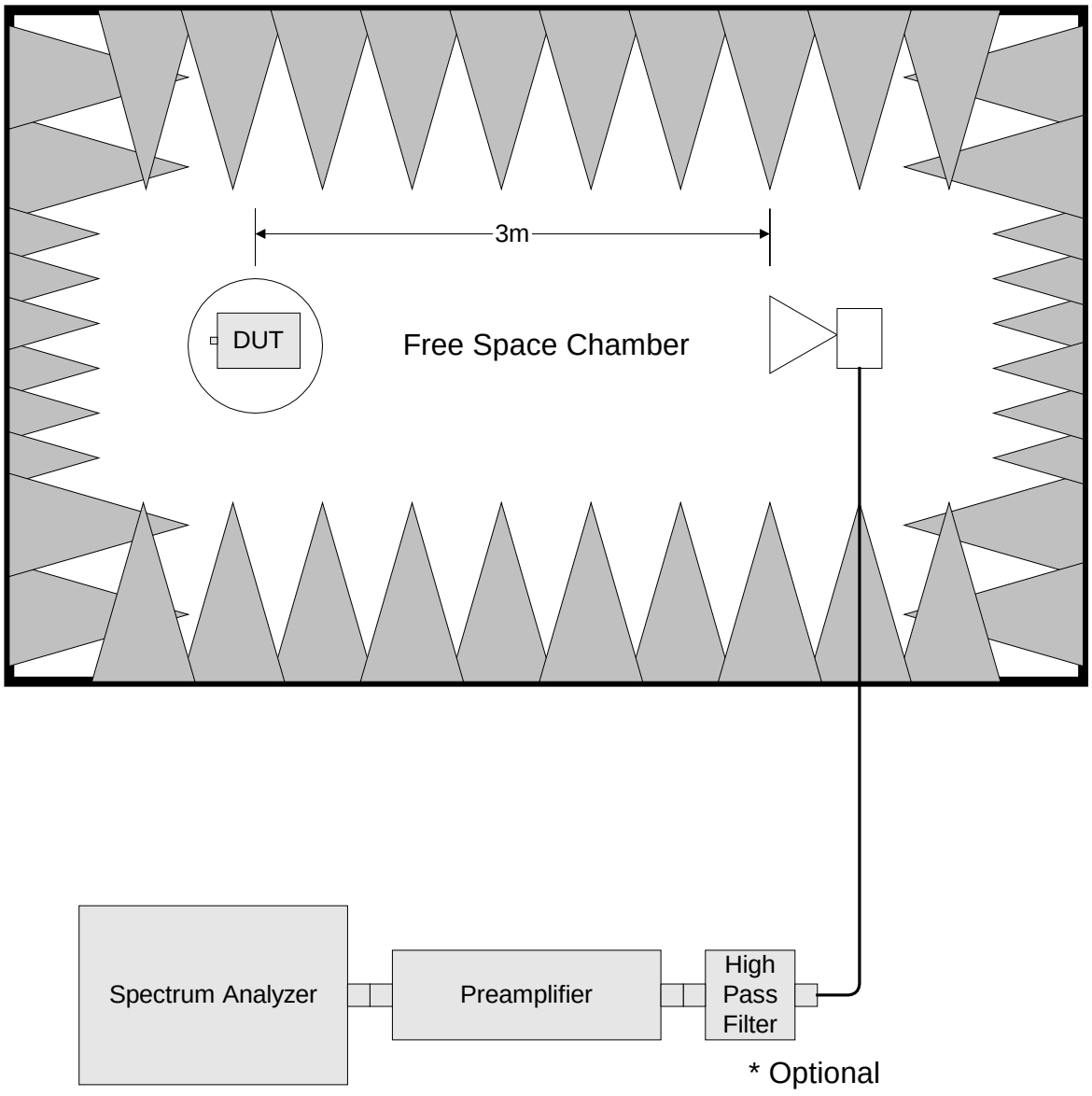
Para. No. 2.1051 Spurious Emissions at Antenna Terminals




Signal Generator
Signal Generator
Signal Generator
Σ
DUT
Attenuator
Attenuator
Spectrum Analyzer

Para. No. 2.1053 - Field Strength of Spurious Radiation




3m
DUT
Free Space Chamber
Spectrum Analyzer
Preamplifier
High
Pass
Filter
* Optional

Para. No. 2.1055 - Frequency Stability