Nemko Test Report No.:	2L0101RUS1
Applicant:	Communication Components 89 Leuning Street 299 Forest Avenue Hackensack, NJ 07606
Equipment Under Test:	DAB-1819-100
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, RF Group Manager
Date:	3/29/02
Total Number of Pages:	33

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Communication Components, Inc.

Model No.: DAB-1819-100

Serial No.: None

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
See " Summary of Test Data".

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	N/A
Occupied Bandwidth (GSM)	24.238	Input/Output	Complies
Occupied Bandwidth (NADC)	24.238	Input/Output	N/A
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	N/A	N/A

Footnotes:

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.
(2) Since this is an amplifier and does not translate the rf input, frequency stability is not applicable.

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

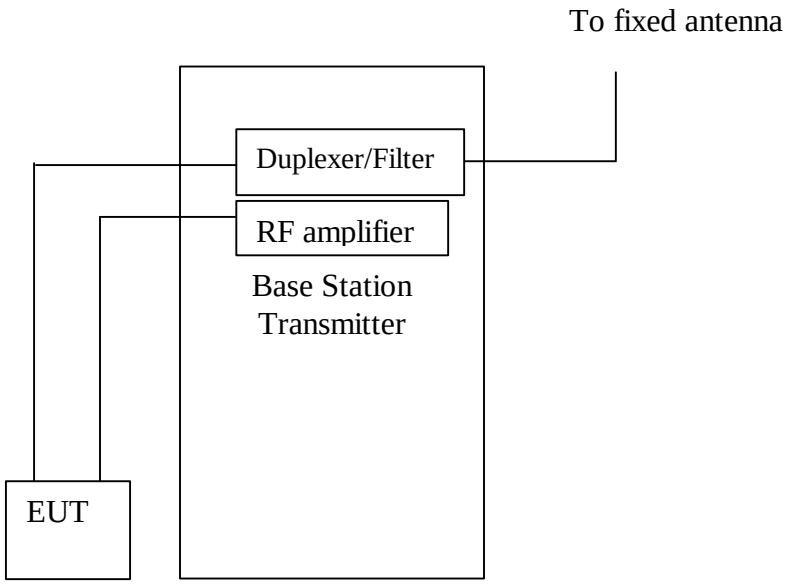
Section 2. General Equipment Specification

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
		CDMA (G7W) ☐ **GSM (GXW)** ☒ **NADC (DXW)** ☐
System Gain:		10 dB
Output Impedance:		50 ohms
		Not tested. The Uplink path is always connected with coaxial connections to a BTS.
		Per channel: 100 W Total: 100 W
		F1-F1 ☒ **F1-F2** ☐ **N/A** ☐
		Software ☐ **Duplexer** ☐ **Fullband** ☒

Description of Operation

The EUT is an RF Amplifier to boost either a PCS or Cellular signal. The amplifier would be operated in an equipment rack and the antenna would be mounted on a pole or tower. The forward direction is wireless but the reverse direction is connected directly to a Base Station Transmitter via coaxial cables.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: D. Light	DATE:3/14/02

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)	Maximum Power Output Delivered to the Antenna (dBm)
1930.2*	GSM	34.7	** N/A	+33.9
1930.3	GSM	50.8	N/A	+50.0
1960	GSM	50.8	N/A	+50.0
1989.7	GSM	50.8	N/A	+50.0
1989.8*	GSM	33.6	N/A	+33.9
Intermodulation (Lower bandedge)	GSM	36.2	***39.2	+38.4
Intermodulation (Upper bandedge)	GSM	40.4	43.4	+42.6

*Power must be reduced at the bandedges to meet emission requirements. Refer to plots in Section 5 of this document.

** This is one carrier only.

***This reading was measured with two carriers at each bandedge.

Footnote – The amplifier is rated at 100 watts(+ 50 dBm) but was tested at maximum level(+50.8 dBm) to compensate for any path loss between the amplifier and antenna. There will always be a duplexer and coaxial cable between the output of the EUT and the transmit antenna. The output of the transmitter is set so that a rf output power not exceeding 100 watts is delivered to the transmit antenna.

Equipment Used: 1036-1629-1055-1064

Measurement Uncertainty: +/- 1.7 dB

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE:3/14/2002

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

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

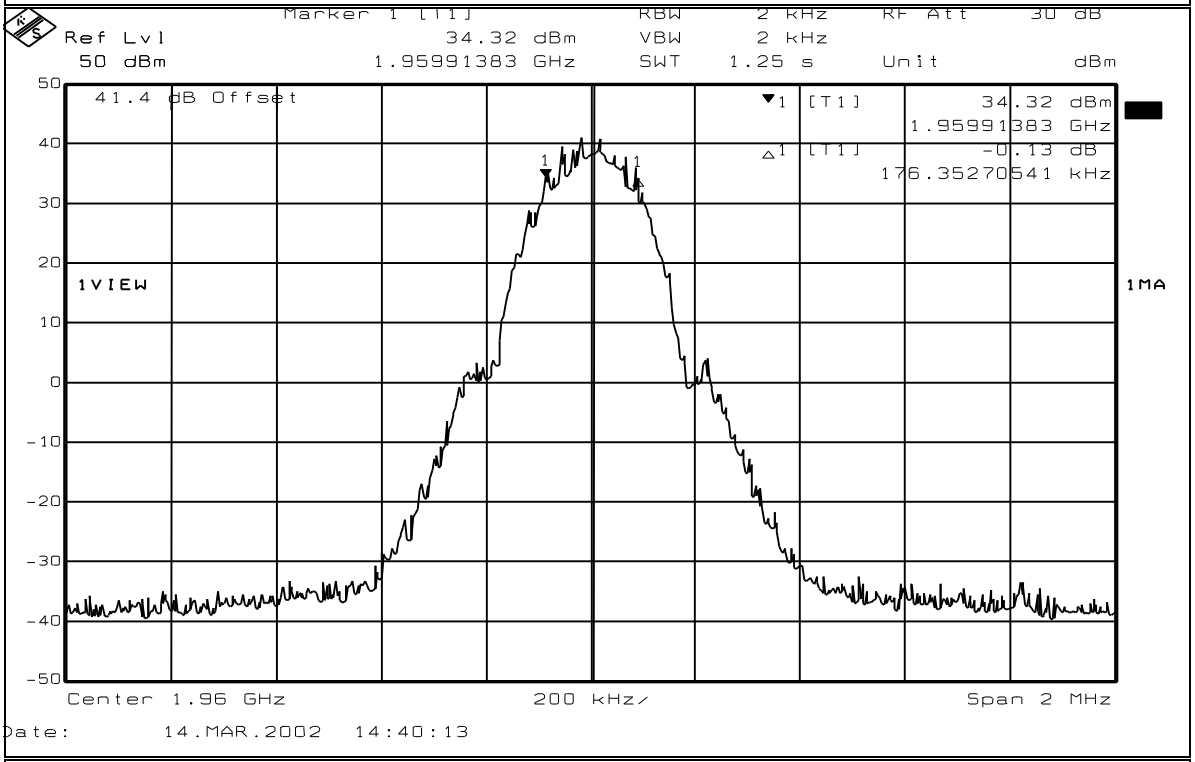
Job No.:	2L0101R	Date:	3/14/2002	Preliminary:	
Specification:	24.238	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%)	40		
E.U.T.:	PCS BAND GSM BOOSTER				
Configuration:	TX FULL POWER				
Sample Number:	1				
Location:	Lab 1	RBW:	2 kHz	Measurement	
Detector Type:	Peak	VBW:	2 kHz	Distance:	N/A m

Test Equipment Used

Antenna:		Directional Coupler:	1055
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: **OUTPUT GSM SIGNAL AT FULL POWER (+50.8 dBm)**

Test Data – Occupied Bandwidth

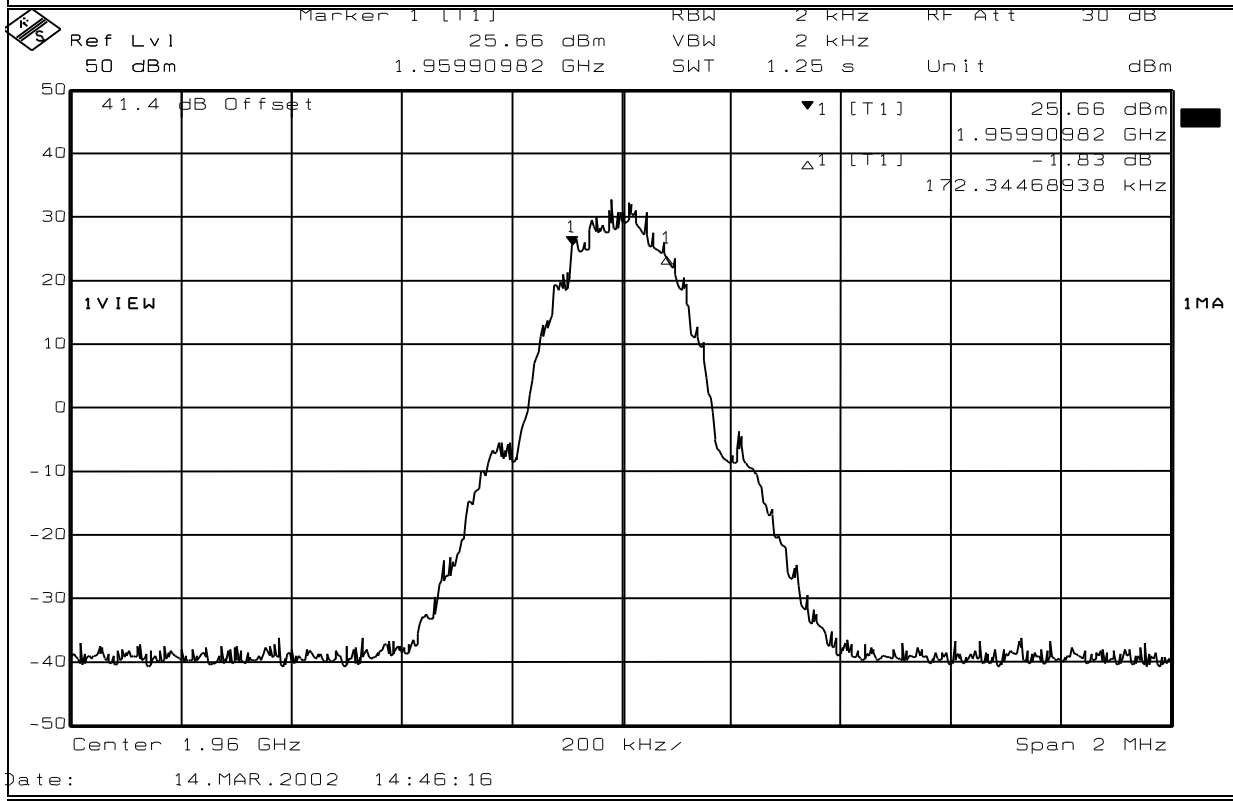
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **OCCUPIED BANDWIDTH**

Page 2 of 2

Job No.:	2L0101R	Date:	3/14/2002
Specification:	24.2	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX FULL POWER		



Notes: **INPUT GSM SIGNAL (+41.0 dBm)**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 2/26/2002

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.7 dB

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 **BANDEDGE DATA**

Page 1 of 6

Complete X
Preliminary:

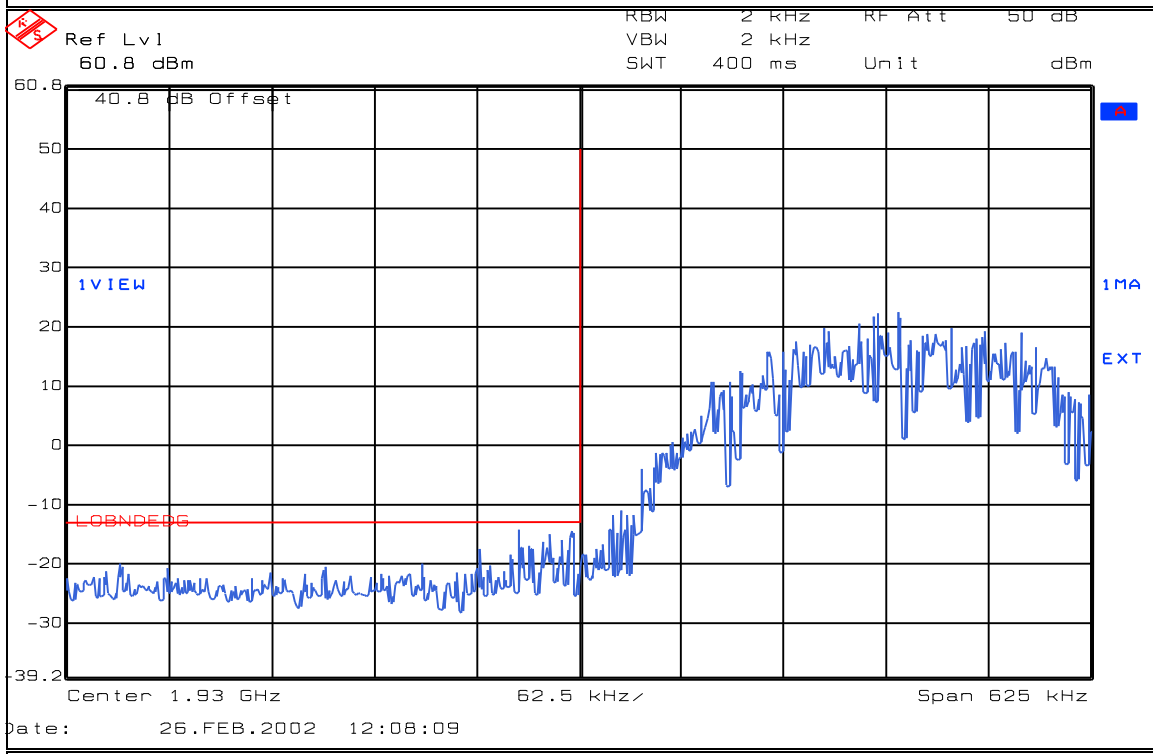
Job No.:	2L0101R	Date:	2/26/2002
Specification:	24.238	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	2 kHz
Detector Type:	Peak	VBW:	2 kHz

Measurement Distance: N/A m

Test Equipment Used

Antenna:		Directional Coupler:	1055
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: **LOWER BANDEDGE - FREQUENCY 1930.2 MHz**
OUTPUT POWER = 34.7 dBm

Test Data – Spurious Emissions at Antenna Terminals

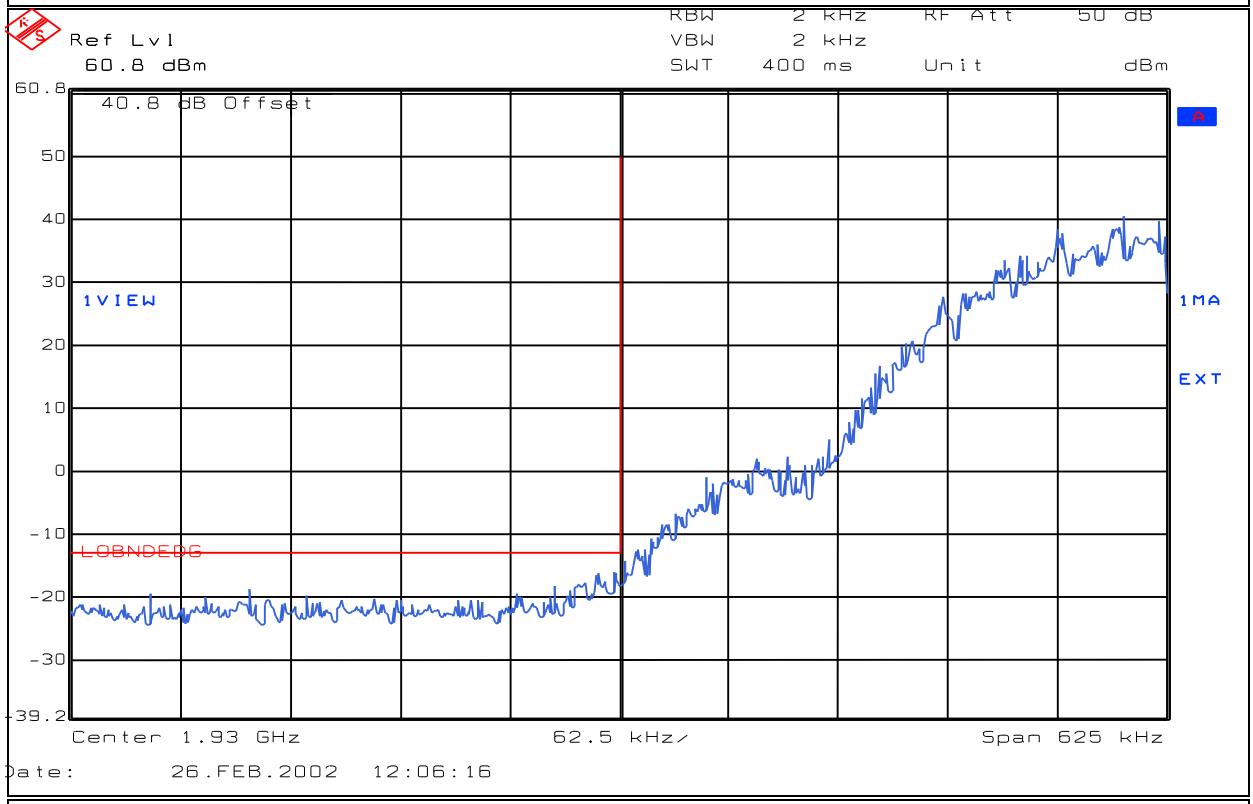
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **BANDEDGE DATA**

Page 2 of 6

Job No.:	2L0101R	Date:	2/26/2002
Specification:	24.2	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX		



Notes: **LOWER BANDEDGE - FREQUENCY 1930.3 MHz**
OUTPUT POWER = 50.7 dBm

Test Data – Spurious Emissions at Antenna Terminals

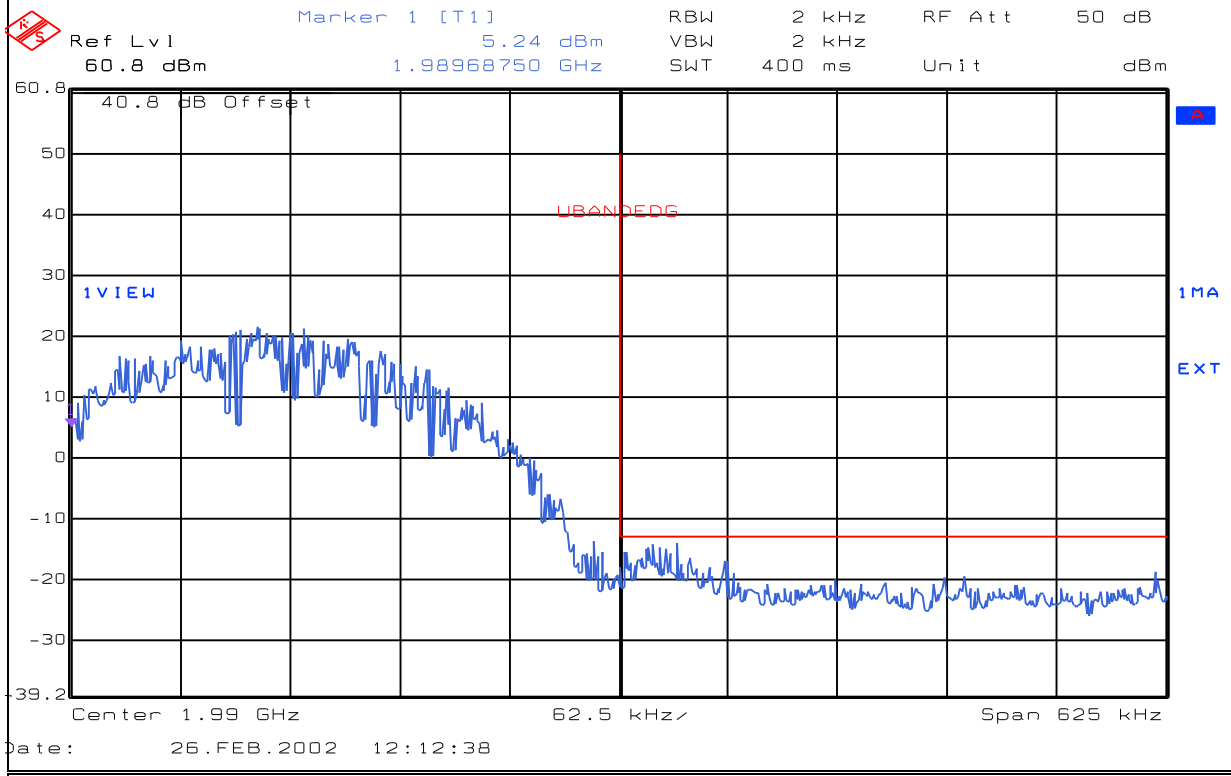
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **BANDEDGE DATA**

Page 3 of 6

Job No.:	2L0101R	Date:	2/26/2002
Specification:	24.238	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX		



Notes: **UPPER BANDEDGE - CF = 1989.8 MHz**
OUTPUT POWER = 33.6 dBm

Test Data – Spurious Emissions at Antenna Terminals

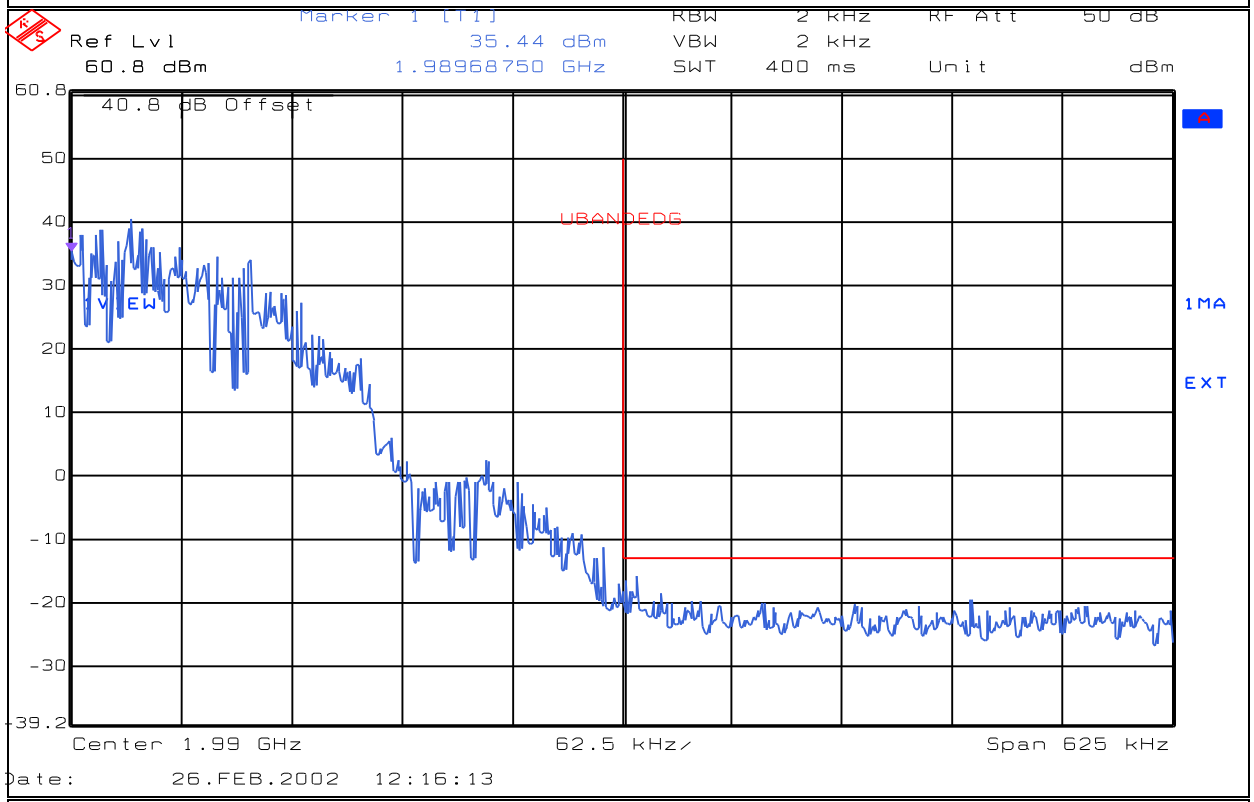
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **BANDEDGE DATA**

Page 4 of 6

Job No.:	2L0101R	Date:	2/26/2002
Specification:	24.238	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX		



Notes: **UPPER BANDEDGE - CF = 1989.7 MHz**
OUTPUT POWER = 50.8 dBm

Test Data – Spurious Emissions at Antenna Terminals

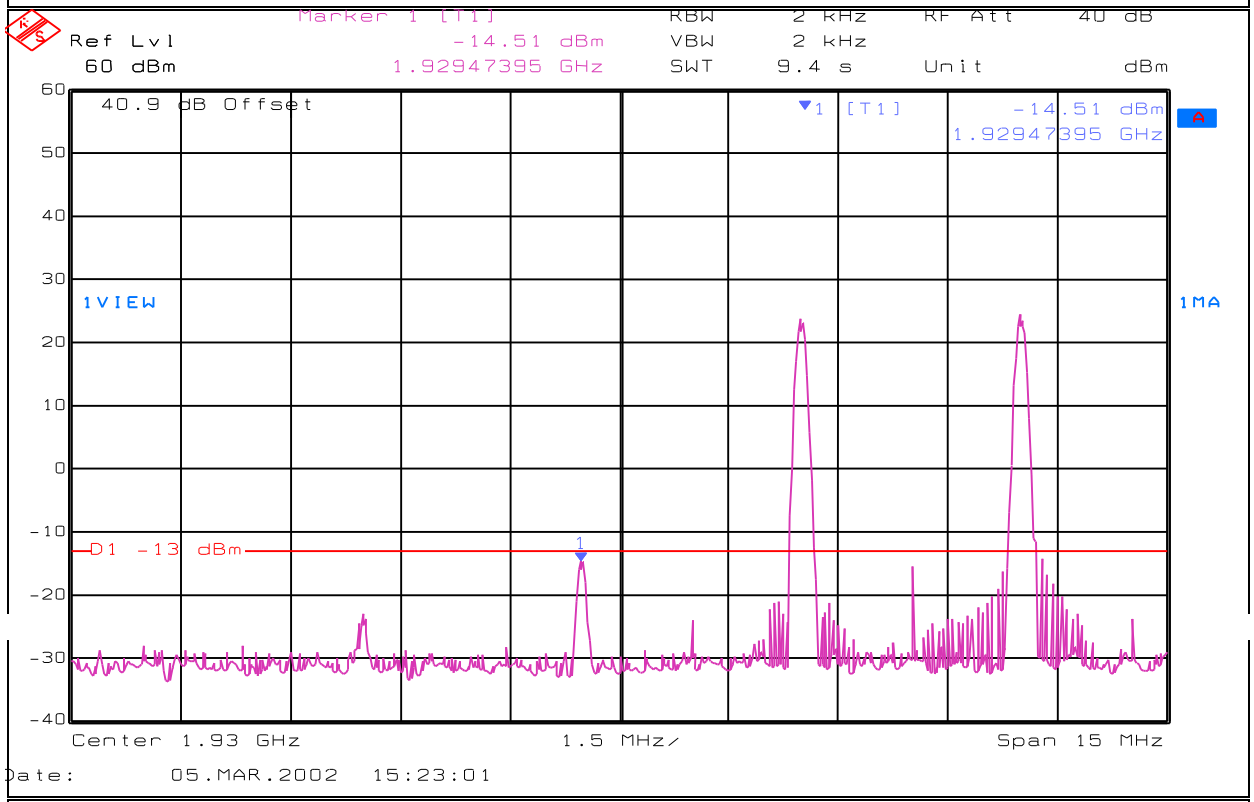
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **BANDEDGE DATA**

Page 5 of 6

Job No.:	2L0101R	Date:	2/26/2002
Specification:	24.238	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	PCS BAND GSM BOOSTER		
Configuration:	TX		



Notes: **Marker indicates highest emission**
RF output = 36.3 dBm Output/carrier (39.3 dBm total)

Test Data – Spurious Emissions at Antenna Terminals

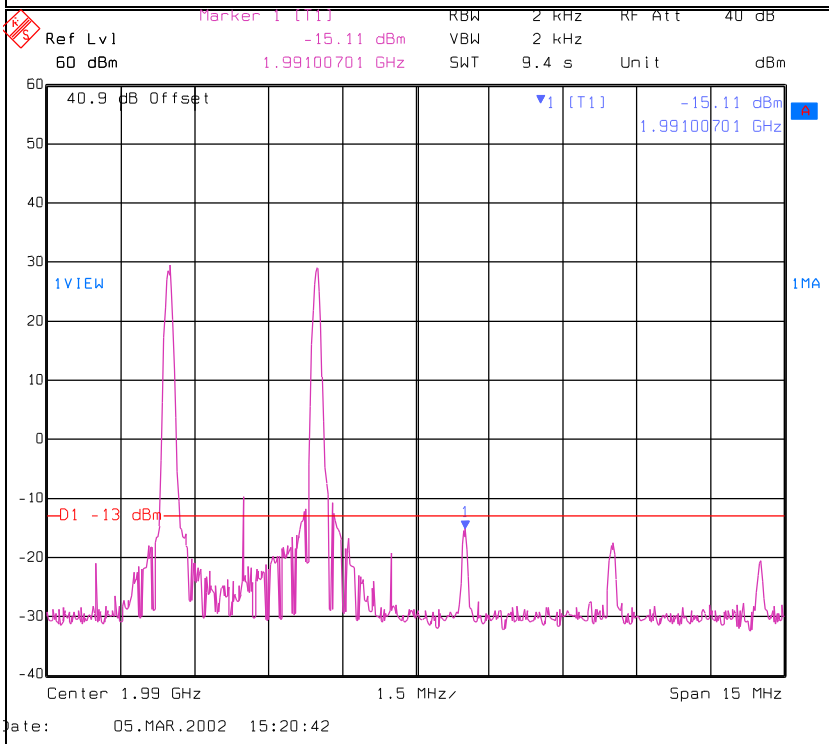
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Test Plot: **BANDEDGE DATA**

Page 6 of 6

Job No.: 2L0101R Date: 2/26/2002
Specification: 24.238 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: PCS BAND GSM BOOSTER
Configuration: TX



Notes: **Marker indicates highest emission**
RF output = 40.4 dBm Output/carrier (43.4 dBm total)

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**

Page 1 of 2 Complete X

Job No.: 2L0101R Date: 2/26/2002 Preliminary:

Specification: 24.238 Temperature(°C): 22

Tested By: Lance Walker Relative Humidity(%) 50

E.U.T.: PCS BAND GSM BOOSTER

Configuration: TX

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

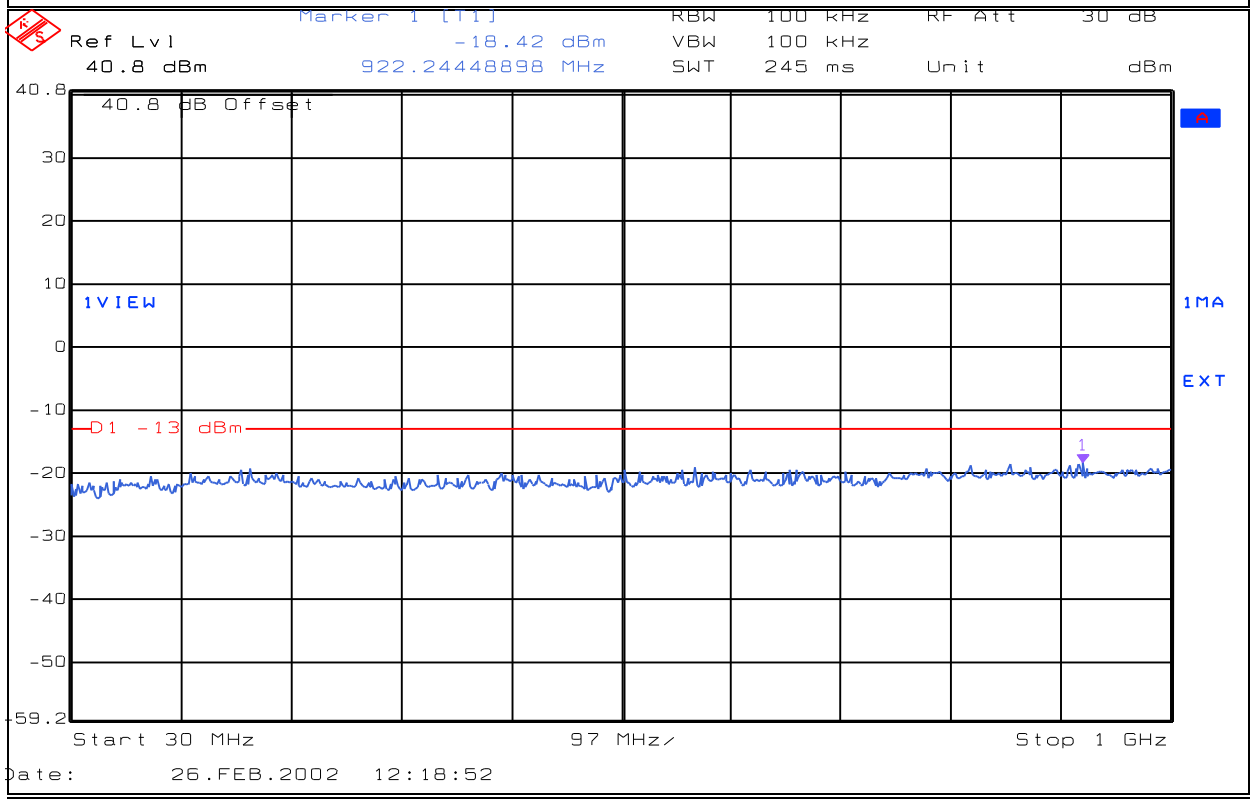
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna:		Directional Coupler:	1055
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:

Test Data – Spurious Emissions at Antenna Terminals

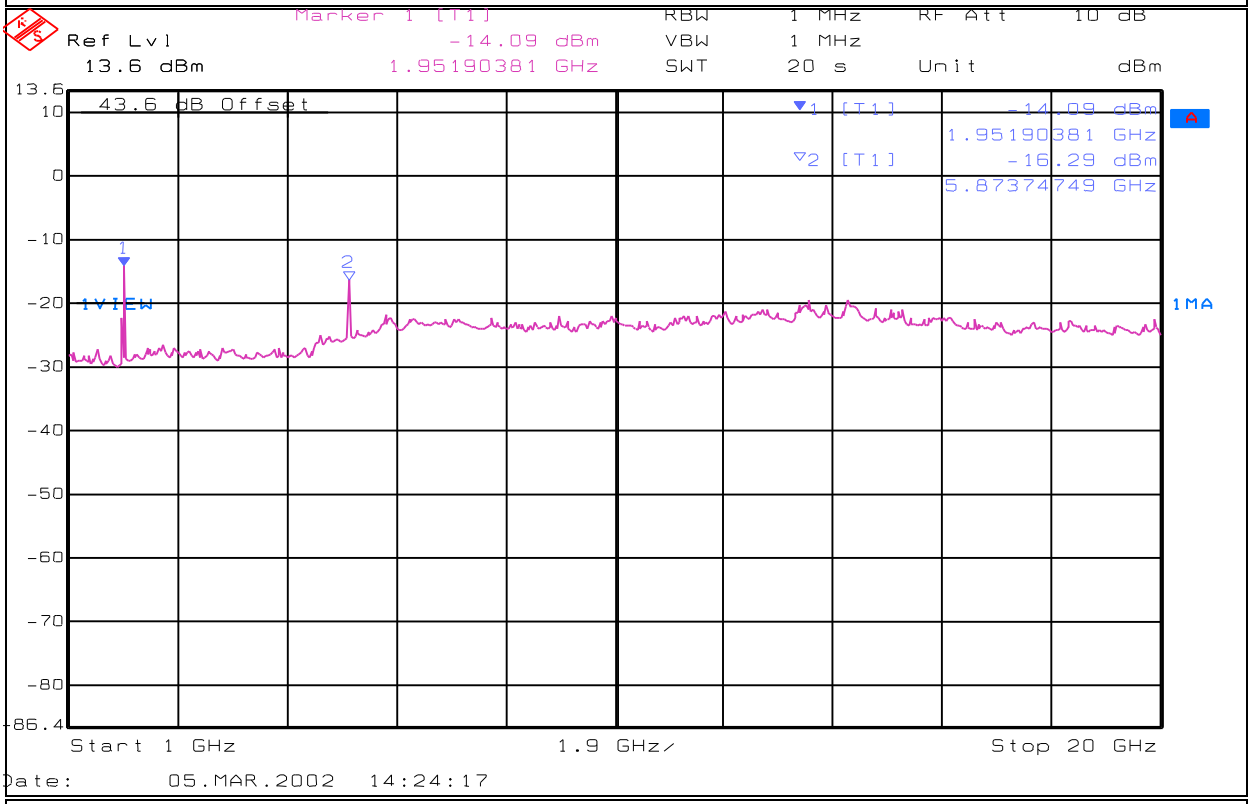
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **SPURIOUS EMISSIONS**

Page 2 of 2

Job No.: 2L0101R Date: 2/26/2002
Specification: 24.2 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: PCS BAND GSM BOOSTER
Configuration: TX



Notes: **Marker 1 indicates Carrier (notched)**
Marker 2 indicates highest emission

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 2/26/2002

Test Results: Complies.

Test Data: See attached table.

Measurement Uncertainty: +/- 3.6 dB

Test Data - Radiated Emissions - Downlink

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

Nemko Dallas, Inc.

Field Strength of Spurious Emissions

Page 1 of 1 — Complete X — Preliminary

Job No.: 2L0101R — Date: 3/5/2002
Specification: PT 24 — Temperature(°C): 22
Tested By: David Light — Relative Humidity(%) 50
E.U.T.: 120 WATT AMPLIFIER
Configuration: TX FULL POWER INTO DUMMY LOAD
Sample No: 1
Location: AC 3 — RBW: 1 MHz — Measurement Distance: 3 m
Detector Type: Peak — VBW: 1 MHz

Test Equipment Used

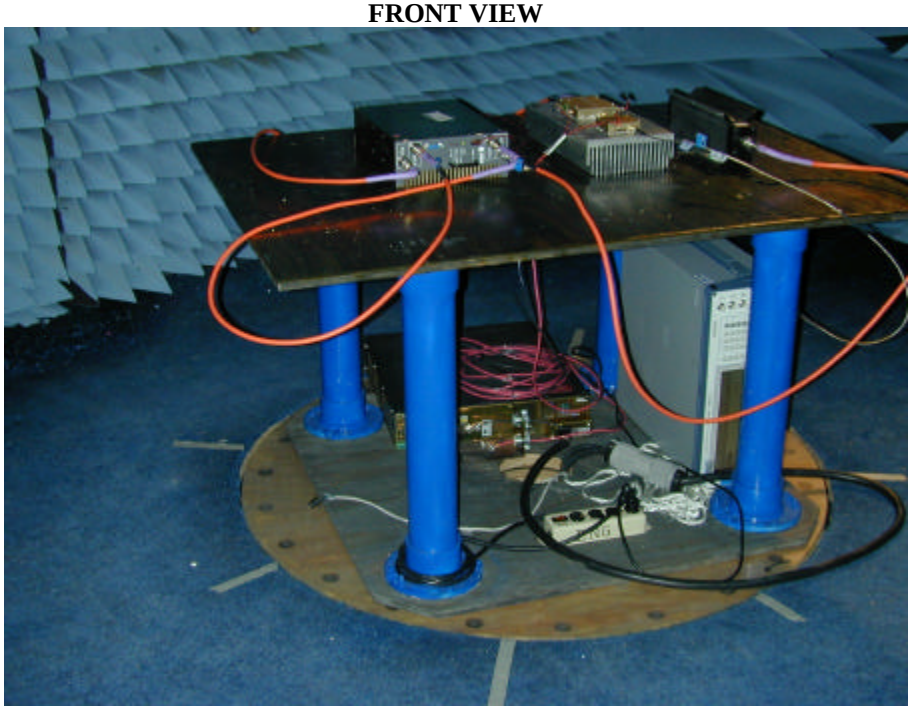
Antenna: 1304 — Directional Coupler:
Pre-Amp: 1016 — Cable #1: 1484
Filter: — Cable #2: 1485
Receiver: 1464 — Cable #3:
Attenuator #1 — Cable #4:
Attenuator #2: — Mixer:
Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
3920	-37.5	35.5		33.3	8.6	-13	-26.8	0.0021	H	
5880	-37.5	37.8		32.7	9.3	-13	-23.1	0.0049	H	
7840	-35.0	41.5		33.7	9.2	-13	-18.1	0.0157	H	
9800	-33.2	43.3		36	10.3	-13	-15.6	0.0274	H	
11760	-46.5	47.0		35.5	10.5	-13	-24.6	0.0035	H	
13720	-57.3	47.7		33.3	10.6	-13	-32.4	0.0006	H	
15680	-57.0	45.5		33.2	12.9	-13	-31.8	0.0007	H	
3920	-36.7	43.3		33.3	8.6	-13	-18.1	0.0154	V	
5880	-35.3	39.8		32.7	9.3	-13	-18.9	0.0128	V	
7840	-36.0	41.8		33.7	9.2	-13	-18.7	0.0134	V	
9800	-33.2	41.8		36	10.3	-13	-17.1	0.0194	V	
11760	-49.0	42.8		35.5	10.5	-13	-31.2	0.0008	V	

Notes: **Scanned to the 10th harmonic**
All emissions within 20 dB of the limit were recorded

Photographs of Test Setup

FRONT VIEW



REAR VIEW

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	CBU
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU
1064	ATTENUATOR	NARDA 776B-20	NONE	09/13/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01

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.

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	**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: 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.: 2.1055**

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

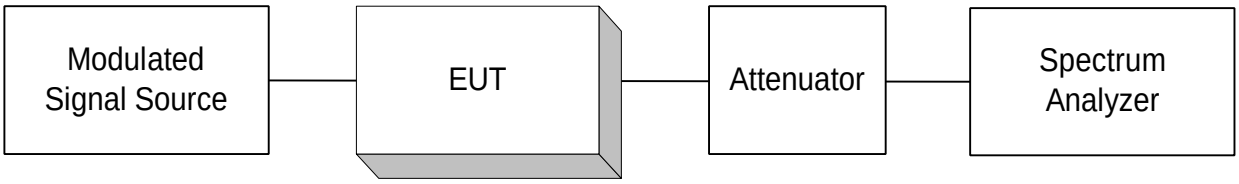
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the 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

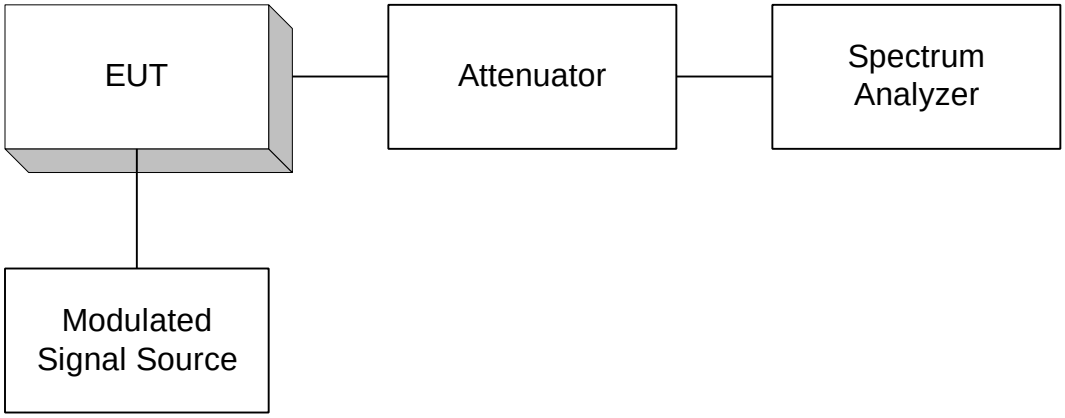
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

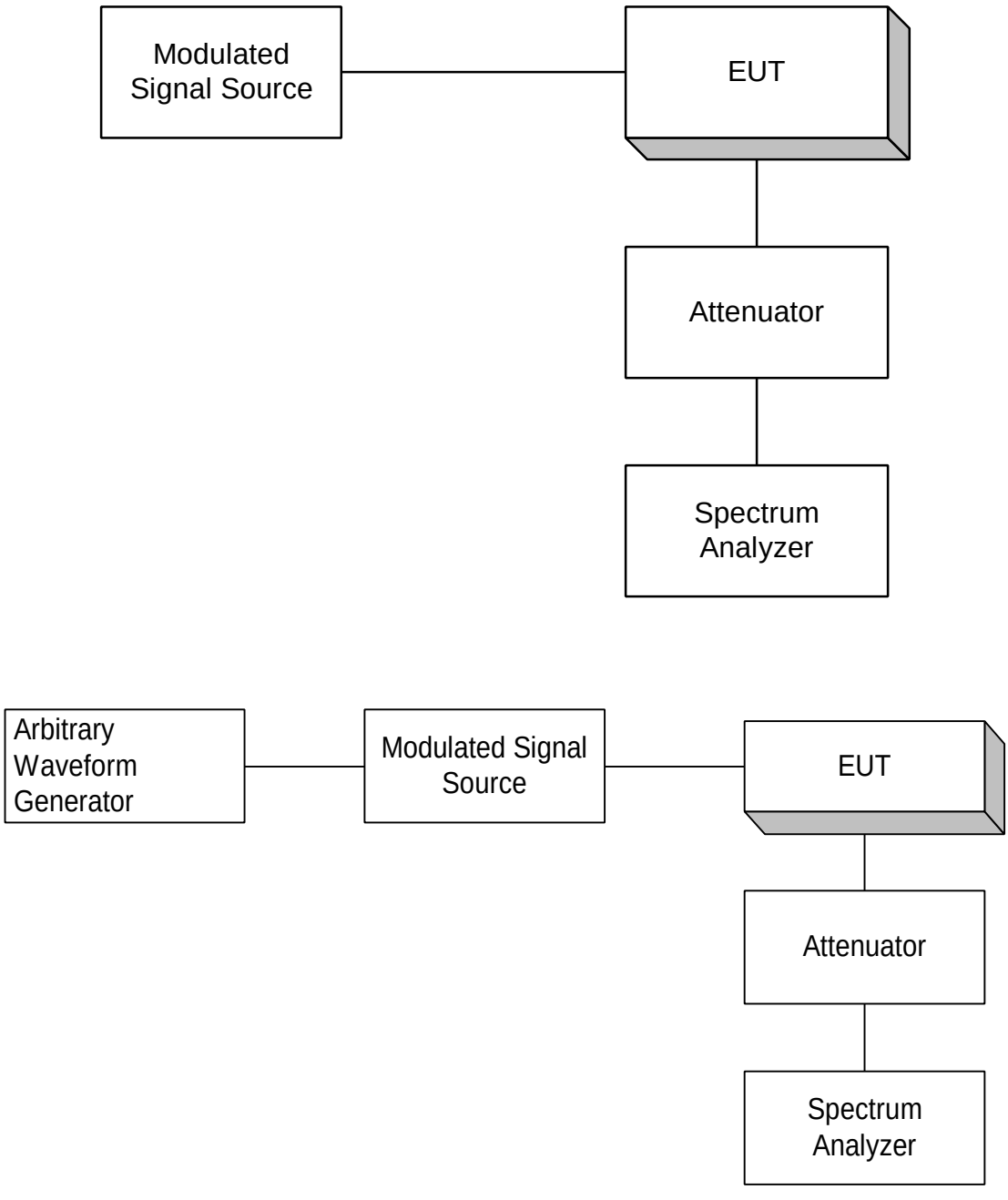
Para. No. 2.985 - R.F. Power Output



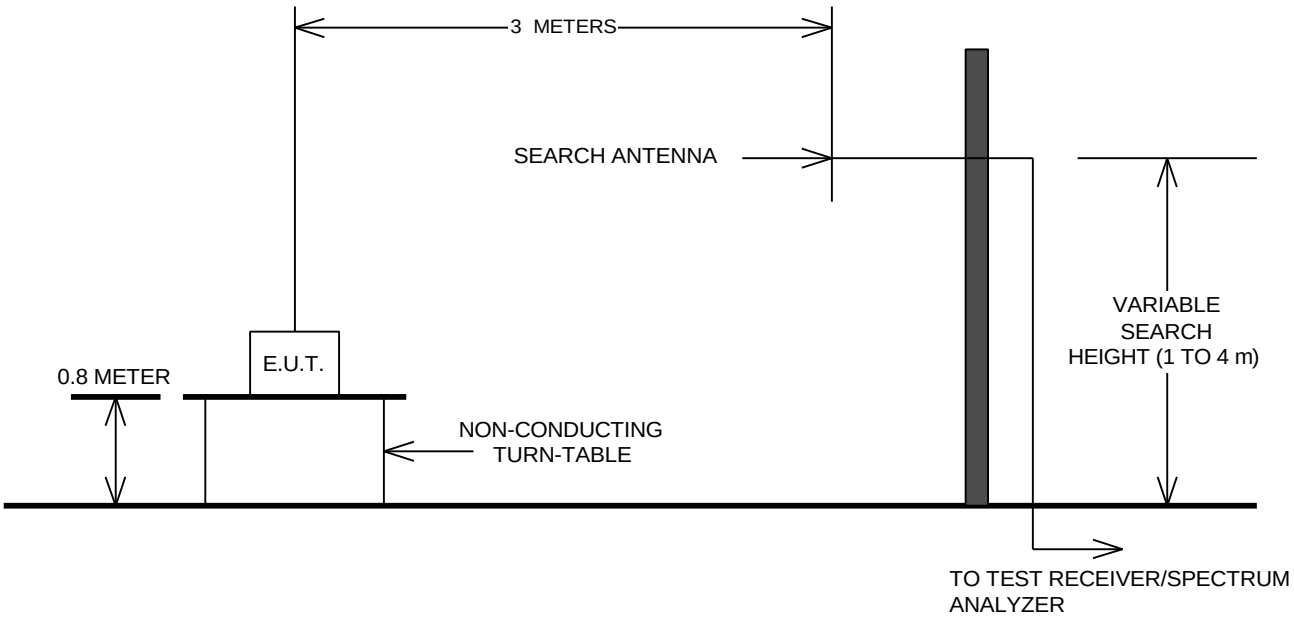
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability