Nemko Test Report No.:	3L0189RUS2
Applicant:	Communication Components 89 Leuning Street 299 Forest Avenue Hackensack, NJ 07606

Equipment Under Test:

In Accordance With:

FCC Part 24, Subpart E Broadband PCS Repeaters

Tested By:

Nemko Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136

Jo- Till

Tom Tidwell, Frontline Manager

Authorized By:

Date:

5/6/2003

DAB-1819

Total Number of Pages:

30

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Section 1. Summary of Test Results

- Manufacturer: Communication Components, Inc.
- Model No.: DAB-1819

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	\square	Production Unit
\boxtimes	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".

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	<100W	Complies
Occupied Bandwidth (GSM EDGE))	24.238	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies

Footnotes:

Section 2. General Equipment Specification

Frequency Bands: Downlin	K: Block A :	1930 – 1945 MHz	
	Block D :	1945 – 1950 MHz	
	Block B :	1950 – 1965 MHz	
	\square 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 Designate	GSM EDGE	GSM (GXW)	NADC (DXW)
Type of Wodulation and Designato		$\overline{\boxtimes}$	
Output Impedance:	50 ohms		
	Not tested. The	Uplink path is always	connected with
RF Output (Rated): Uplink	coaxial connection	ons to a BTS.	
	Dar abannal:	100 W	
RF Output (Rated): Downlind	Total:	100 W	
Frequency Translation:	F1-F1	F1-F2	N/A
	Software	Duplexer	Fullband
Band Selection:		<u> </u>	\square

Description of Modifications for Class II Permissive Change

The modulation parameter for GSM EDGE (G7W) is being added. No hardware or software changes have been made.

Description of Operation

The EUT is an RF Single Channel Amplifier to boost a PCS. 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



To fixed antenna

DATE:3/5/03

EQUIPMENT: DAB-1819

Section 3. RF Power Output

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

TESTED BY: D. Light

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)
1930.2*	EDGE	31.5	** N/A
1930.3	EDGE	49.0	N/A
1989.7	EDGE	48.5	N/A
1989.8*	EDGE	33.5	N/A
Intermodulation (Lower bandedge)	EDGE	41.0	***43.0
Intermodulation (Upper bandedge)	EDGE	40.6	43.6

*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.

Note-Intermodulation characteristics are being reported but the amplifier is meant for single channel use only.

Equipment Used: 1036-1629-1055-1064

Measurement	+/- 1.7	dB
Uncertainty:		

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (GSM EDGE)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 5/5/2003

Test Results:	Complies.
---------------	-----------

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

Test Data – Occupied Bandwidth



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

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Data Plot				<u>Occ</u>	cupied l	Bandwie	<u>ith</u>				
Page <u>1</u> of	2								Complete	х	_
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ecification:	24.38		Temper	ature(°C):	23	_					
sted By:	Eldon Berry		Relative Hu	midity(%)	50						
J.T.:	PCS Band G	SM Booster									
nfiguration:	TX										
mple Number:	1										
cation:	Lab 1	_			RBW	: Refer to pl	ots		Measurement		
tector Type:	Peak				VBW	: Refer to pl	ots		Distance:		m
est Equipme	ent Used										
tenna:				Directi	ional Couple	r: 1055					
-Amp:		-			Cable #1	1: 1627					
er:					Cable #2	2:					
ceiver:	1036				Cable #3	3:					
enuator #1	1064				Cable #4	4:					
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asurement Und	certainty:	+/-1.7 dB			RBW	2 k	Hz R	F Att	20 dB		
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Notes:	80 watt am	p output plo	t								
		r output plo	-								

Test Data – Occupied Bandwidth



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Nem	nko Dallas, I	Inc.								
<u>a Plot</u>				Occ	upied I	Bandwie	<u>lth</u>			
Page <u>2</u> of	2									
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cation:	24.4		Temper	rature(°C): 23		_				
By:	Eldon Berry		Relative Hu	midity(%) 50		_				
	PCS Band GSN	M Booster								
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otes:	80 watt amp	input plot								

Section 5. Spurious Emissions at Antenna Terminals

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

- **Test Data:** See attached plot(s).
- Measurement +/- 1.7 dB Uncertainty:

Note-Intermodulation characteristics are being reported but the amplifier is meant for single channel use only.

Nen	nko Dallas, Ind		D		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667					
Page <u>1</u> of b No.:	5 <u>7</u> 3L0189R	<u>Spuri</u>	ous Emis	sions at A	antenna T	<u>erminals</u>	Complete Preliminary:	Х		
ecification: ested By: U.T.: onfiguration:	PART 24 David Light PCS Band Booste	Tempe Relative H r	erature(°C):	22 40			·			
nple Number: cation: tector Type:	1 Lab 1 Peak			RBW: <u>R</u> ø VBW: <u>Rø</u>	efer to plots		Measurement Distance:	N/A r	n	
est Equipmo tenna: e-Amp: ter: ceiver: tenuator #1 tenuator #2: Iditional equip easurement Un	Image: Display state 1036 1064 ment used: certainty:	1.7 dB	Directio	nal Coupler: Cable #1: 16 Cable #2: Cable #3: Cable #3: Mixer:	1055					
Ref 50	Lvl dBm	Marker 1	1 [T1] 30. .989697	60 dBm 39 GHz	RBU VBW SWT	2 k 2 k 640 m	Hz RF Hz Is Ur	- Att nit	<u>10 dB</u>	n
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-50 Cen te:	ter 1.99 06.MAN	GHz 2003 13	:02:46	100	kHz∕			Spa	an 1 MHz]
Notes:	UpperBandedg 1989.7 MHz CH	e F @ 80 Watts outp	ut (Rated pow	ver)						

Test Data – Spurious Emissions at Antenna Terminals



 Ballas Headquarters:

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 Lewisville, TX 75057

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 Fax: (972) 436-2667

Ne	emko Da	allas, Inc.							۵۰۰۰ (0.2) 100 200				
Data Plo	ot		Spur	ious Emis	sions	s at A	.ntenna T	ermina	s					
Page 2	of <u>7</u>													
Job No.:	3L018	9R		Date: 5/6	/2003									
Specification:	PART	24	Temp	erature(°C): 22										
Tested By:	David	Light	Relative H	lumidity(%) 40										
E.U.I.: Configuration:	PCS B	and Booster												
Configuration.	17													
			Marker	1 [T1]			RBW	2	КH	z RF	Att	10	dB	
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Notes:	UPPE	R BAND EDO	GE											
	1989.8	8 MHz @ 2.2 V	Watts (33.5 dl	Bm)										
			·											

Nemko Dallas, Inc.	mke		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667						
Data Plot	<u>Spuriou</u>	ıs Emissi	ions at A	Antenna T	<u>erminals</u>				
Page 3 of 7 ob No.: 3L0189R pecification: PART 24 Cested By: David Light CUT.: PCS Band Booster Configuration: TX	Temperatu Relative Humi	Date: 5/6/2 rre(°C): 22 dity(%) 40	003						
Ref Lvl 50 dBm	Marker 2	[T1] 22.4 897000	1 dBm 0 GHz	RBW VBW SWT	2 k 2 k 1.25	Hz Ri Hz s Ui	F Att nit	10 dB dBm	ı
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Notes: Intermodulation ch Markers indicate c Output power equa	naracteristics arriers als 40.6 dBm (11.5	Watts) per	carrier or 2	23Watts comp	osite				

Ner	nko Dallas, Inc.	mk	0		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667						
Fest Plot :	-	<u>Spuri</u>	ous Emiss	ions at A	ntenna T	<u>erminals</u>					
Page <u>4</u> o ob No.: pecification: ested By: U.T.: onfiguration:	f 7 3L0189R PART 24 David Light PCS Band Booster TX	Tempe Relative H	Date: $\frac{5/6/2}{22}$ arature(°C): 22 umidity(%) 40	003							
Ref 50	L∨l .5 dBm	Marker 13	2 [T1] _15.0 .8369138	18 dBm 13 GHz	RBW VBW SWT	1 M 1 M 200 m	Hz Hz s	RF Att Unit	o di di	3 3 m	
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Notes:	06.MAY Marker 1 indicate	2003 12 s carrier (Notch	: 29 : 12 ed), Marker 2	indicates hig	chest emission	ı (Noise floor))				

Nemko Dallas, Inc.	mko		802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667						
st Plot:	<u>Spurious Emis</u>	sions at A	ntenna T	<u>erminals</u>					
Page 5 of 7 o.: 3L0189R fication: PART 24 d By: David Light C:: PCS Band Booster guration: TX	Date: 5/6 Temperature(°C): 22 Relative Humidity(%) 40	/2003							
Ref Lvl 60 dBm	Marker 1 [T1] 14. 1.930200	75 dBm 00 GHz	RBW VBW SWT	2 k 2 k 1.25	Hz Ri Hz s Ui	F Att nit	20 dB dBr	ı	
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lotes: Lower band edge 1930.2 MHz @ 31.5	dBm output (1.4 Watts)								

Spurious Emissions at Antenna Terminals Page 6 of 7 > No.: 3L0189R cecification: PART 24 remperature(°C): 22 sted By: David Light N.T.: PCS Band Booster nfiguration: TX Marker 1 LT1 Ref Lv1 29,59 dBm VBW 2 kHz 60 dBm 1.93030000 GHz SWT 640 ms Unit	
Page 6 of 7 Date: 5/6/2003 b No.: 3L0189R Date: 5/6/2003 ecification: PART 24 Temperature(°C): 22 sted By: David Light Relative Humidity(%) 40 J.T.: PCS Band Booster nfiguration: TX Ref L v 1 29.59 dBm VBW 2 kHz 60 dBm 1.93030000 GHz SWT 640 ms Unit	
Marker 1 [T1] RBW 2 kHz RF Att 20 de Ref Lv1 29.59 dBm VBW 2 kHz 60 dBm 1.93030000 GHz SWT 640 ms Unit de	
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te: 06.MAY 2003 08:28:00	
Notes: Lower band edge	
1930.3 MHz @ 48.5 dBm (70.8 Watts)	

Nemko Dallas, Inc.	mko	802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667						
Test Plot:	<u>Spurious Emis</u>	sions at Ai	ntenna T	erminals				
Page 7 of 7 Job No.: 3L0189R Specification: PART 24 Tested By: David Light E.U.T.: PCS Band Booster Configuration: TX	Page 7 of 7 No.: 3L0189R cification: PART 24 Temperature(°C):							
Ref Lvl 60 dBm	Marker 2 [T1] 24. 1.930700	37 dBm 00 GHz	RBW VBW SWT	2 k 2 k 1.25	Hz R Hz s U	F Att nit	20 dB dBm	1
50 50 40 30 1VIEW 20 10 -10 LOBNDEDG -20 -30	e t	w	Ma	*2 •1		24 1.93070 24 1.93030	.37 dBm 000 GHz .27 dBm 000 GHz	1MA EXT
-40 	z	200 k	Hz/			Spa	l an 2 MHz	J
Date: D6.MAY 2	003 09:46:32							
Notes: Intermodulation ch Markers indicate ca Output power equa	aracteristics arriers ls 41 dBm (12.6 Watts) per	carrier or 25.2	Watts comp	osite				

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
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	Cal Not Req	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1627	CABLE, 5 ft	MEGAPHASE 10312 1GVT4	N/A	CBU	N/A

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 peakE.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 π R² = E²/120 π and proceeding as follows:

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

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

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

FCC PART 24, SUBPART E BROADBAND PCS REPEATERS PROJECT NO.: **3L0189RUS2**

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:

<u>CDMA</u>

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

<u>GSM</u>

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

NADC

RBW: 1 kHz VBW: \geq 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:

<u>CDMA</u>

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

<u>NADC</u>

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

<u>GSM</u>

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

