



Certelecom Laboratories Inc.

Safety - EMI - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON:
THE COMMUNICATIONS COMPONENTS INC.
"BI-DIRECTIONAL AMPLIFIER"**

FCC ID: NT3BDA8087

**IN ACCORDANCE WITH:
FCC PART 90, SUBPART I**

PROJECT NO.: 7R00506

TESTED FOR:

**COMMUNICATION COMPONENTS INC.
299 FOREST AVENUE
PARAMUS, NEW JERSEY
07652
USA**

TESTED BY:

**CERTELECOM LABORATORIES INC.
3325 RIVER ROAD, R.R. 5
OTTAWA, ONTARIO K1V 1H2**

FEBRUARY 1998

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This report applies only to the items tested.

EQUIPMENT: *The Communications Components Inc. "Bi-Directional Amplifier"*
FCC ID: NT3BDA8087

MODEL NO.: BDA-8087-52

SERIAL NO.: None

GENERAL:

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, Subpart I.

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**

TESTED BY: Kevin Carr DATE: 16 Mar 98
Kevin Carr, Technologist

APPROVED BY: W. Waterhouse DATE: 17th April 1998
W. Waterhouse, RF Engineering Lab Manager

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

SUMMARY OF TEST DATA

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT	PAGE NO.
RF Power Output	90.205	<500W	Plot	Complies	7
Audio Frequency Response	TIA/IEA-603.3.2.6	N/A	N/A	N/A	8
Audio Low-Pass Filter Response	N/A	N/A	N/A	N/A	9
Modulation Limiting	N/A	N/A	N/A	N/A	10
Occupied Bandwidth	90.210	Input vs Output	Plot	Complies	11
Spurious Emissions at Antenna Terminals	90.210	-13dBm	Plot	Complies	19
Field Strength of Spurious Emissions	90.210	-13dBm	Plot	Complies	31
Frequency Stability	90.213	N/A	N/A	N/A	33
Transient Frequency Behaviour	90.214	N/A	N/A	N/A	N/A

FOOTNOTES FOR N/A'S:

The E.U.T. has no modulation circuitry.

*EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"**FCC ID: NT3BDA8087*

GENERAL EQUIPMENT SPECIFICATION**TRANSMITTER**

Power Input: 120 VAC, 60 Hz

Frequency Range: Uplink: 806 MHz to 821 MHz
Downlink: 851 MHz to 866 MHz

Tunable Bands: Not Applicable

Type of Modulation: F.M., IDEN

Emission Designator: F3E, D7W

Output Impedance: 50 ohm

Gain: 55 dB Nominal

RF Power Output (rated)		<u>Uplink</u>	<u>Downlink</u>
F3E	Single:	460.26 mW	380.19 mW
	Composite:	152.41mW/3 Carriers	125.89 mW/3 Carriers
D7W	Single:	249.46 mW	230.67 mW
	Composite:	82.60mW/3 Carriers	76.38mW/3 Carriers

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
FCC ID: NT3BDA8087

GENERAL EQUIPMENT SPECIFICATION

RECEIVER

Frequency Range:

Tunable Bands:

Local LO:

1st IF:

2nd IF:

Bandwidth:

Type of modulation:

Operator Selection of
Operating Frequency:

NOT APPLICABLE

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

THEORY OF OPERATION

The BDA-830-52 is a bi-directional amplifier. The E.U.T. is designed to exchange radio communications in buildings, basements, tunnels and other shielded environments. It improves sensitivity of base stations in indoor locations where there is a significant amount of cable loss in RF distribution systems.

It contains two amplifiers providing amplification of RF signals in up-link and down-link frequency bands. They are connected to the external cables via frequency selective duplexers in order to attenuate all signals that are not in the designated bands.

*EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"**FCC ID: NT3BDA8087*

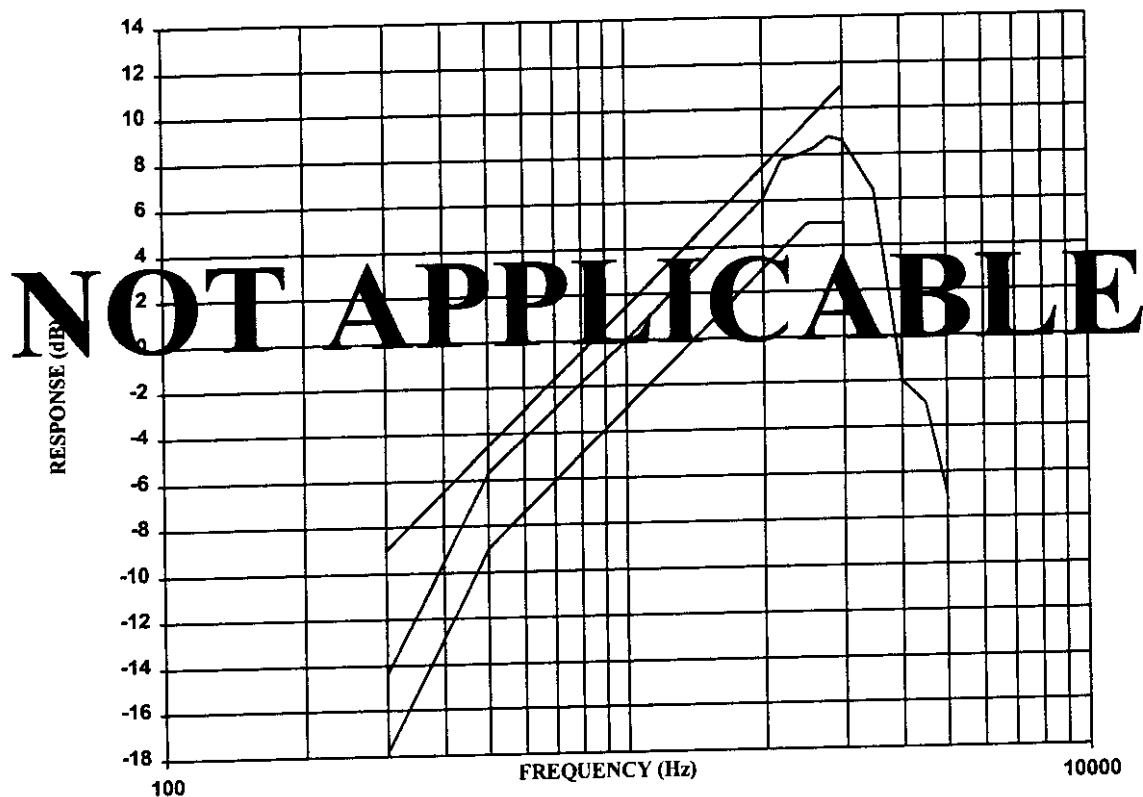
NAME OF TEST: RF Power Output	PARA.NO.: 2.985
TESTED BY: Kevin Carr	DATE: February 20, 1998

Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Measured/Rated (dB)
Uplink	26.63	27.0	-0.37
Downlink	25.8	27.0	-1.2

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
 FCC ID: NT3BDA8087

NAME OF TEST: Audio Frequency Response

PARA.NO.: 2.987(a)



AUDIO FREQUENCY RESPONSE

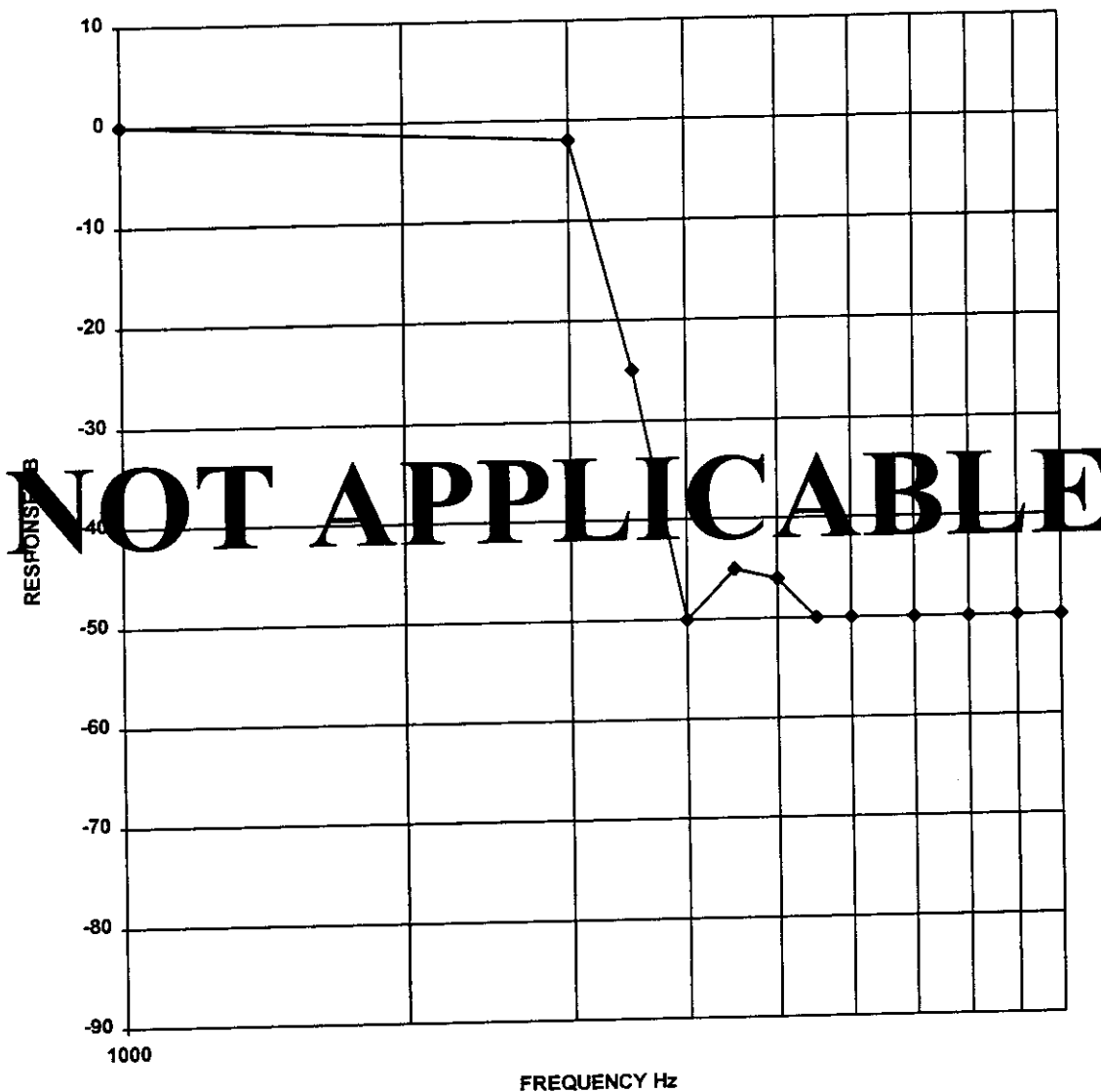
Frequency	300	600	900	1.2 k	1.5 k	1.8 k	2.1 k	2.3 k	2.6 k	3.0 k	3.5 k	4 k

Frequency	4.5 k	5 k	5.5 k	6 k	6.5 k	7 k	7.5 k	8 k	8.5 k	9 k	9.5 k	10 k

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

NAME OF TEST: Audio Low-Pass Filter Frequency Response PARA.NO.: 2.987(a)



AUDIO LOW PASS FILTER RESPONSE

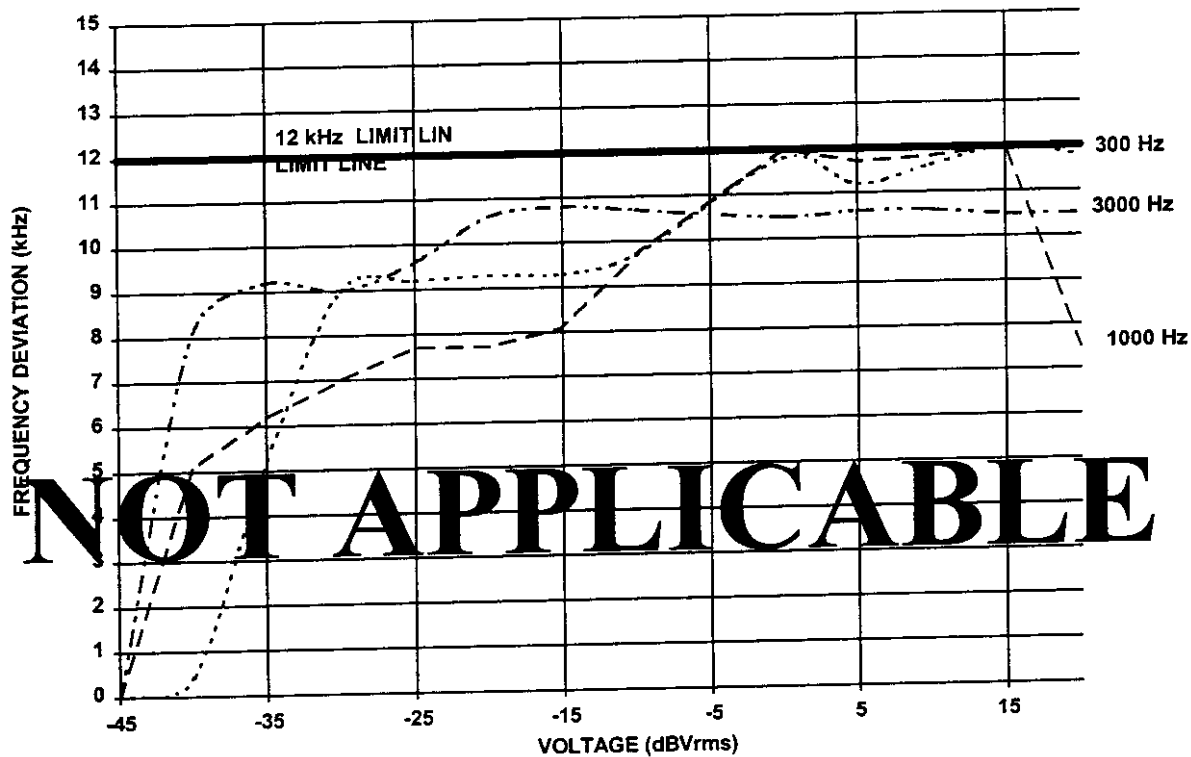
Frequency	1k	3 k	3.5 k	4 k	4.5 k	5 k	5.5 k	6 k	7 k	8 k	9 k	10 k

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

NAME OF TEST: Modulation Limiting

PARA.NO.: 2.987(b)

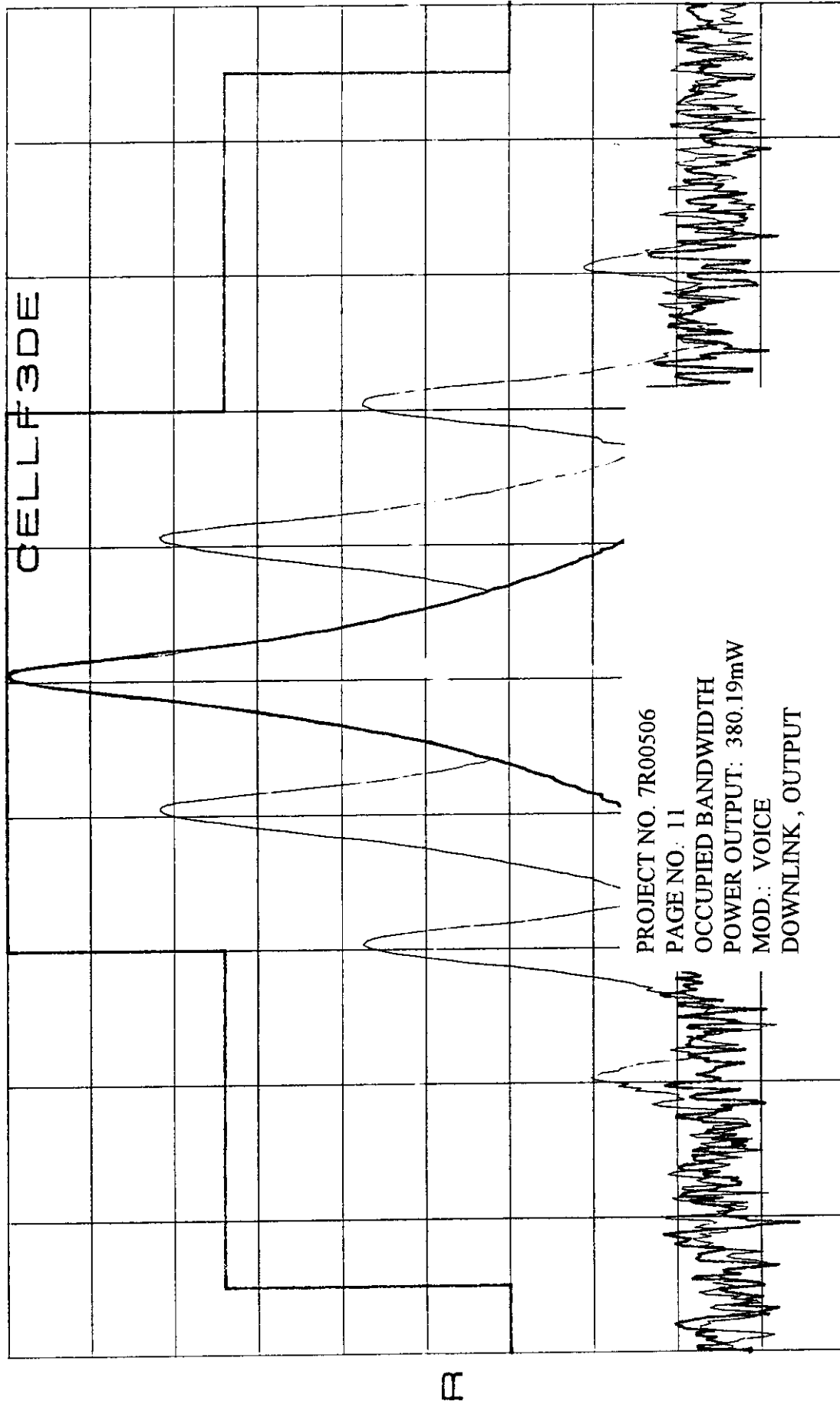


MODULATION LIMITING

Input	-45	-40	-35	-30	-25	-20	-15	-10	0	5	10	15	20
300 Hz	0	0.452	5.2	9	9.2	9.3	9.3	9.7	11.8	11.2	11.6	12	11.8
1k Hz	0	5.1	6.2	7	7.7	7.7	8.1	9.7	12	11.7	11.8	12	7.5
Limit	12	12	12	12	12	12	12	12	12	12	12	12	12
3k Hz	0	8.1	9.2	9	9.6	10.6	10.8	10.7	10.5	10.6	10.6	10.5	10.5

*ATTEN 10dB
RL 25.8dBm

10dB/

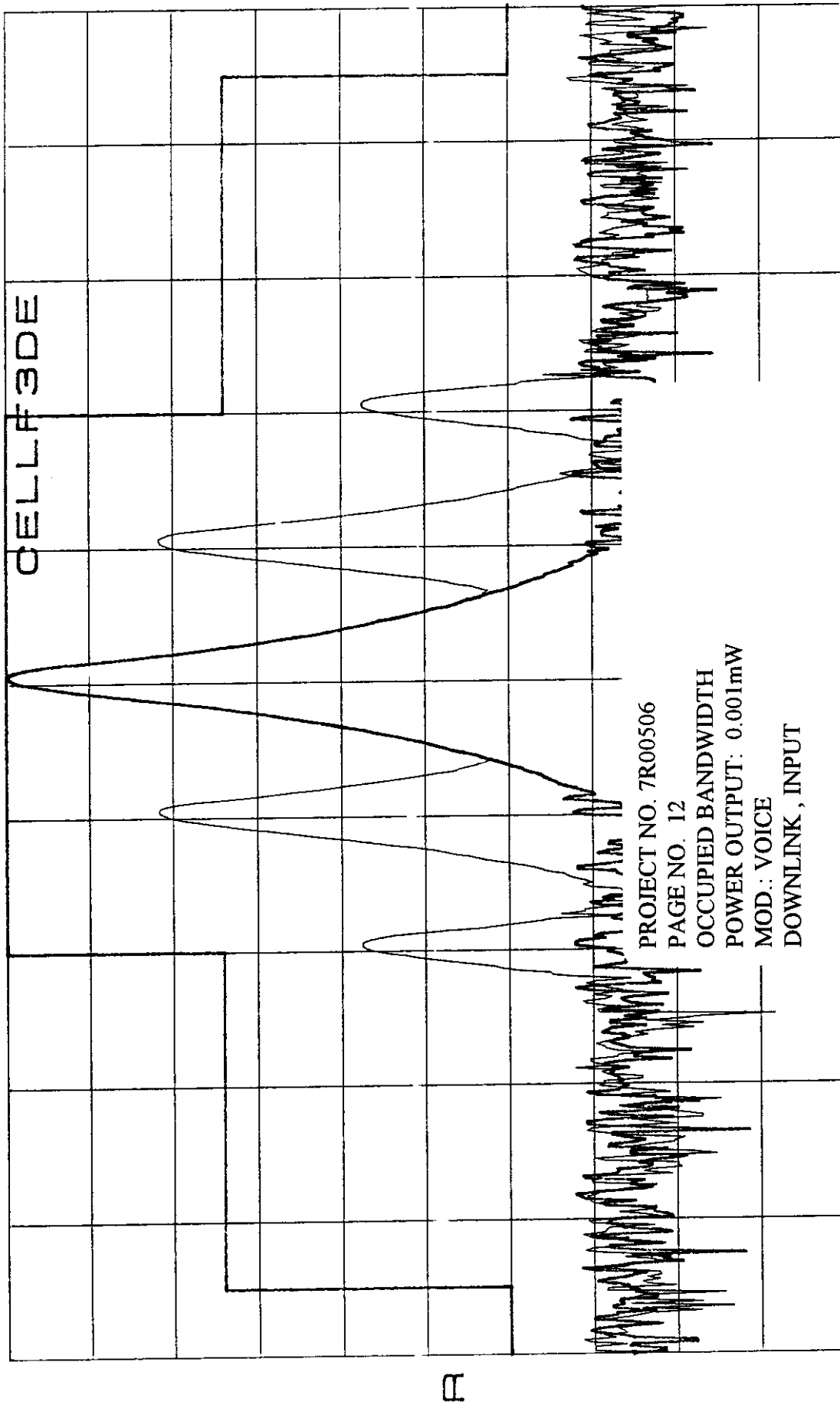


CENTER 859.0000MHZ SPAN 100.0KHZ
*RBW 1.0KHZ VBW 1.0KHZ SWP 250ms

*ATTEN 0dB

RL -30.2dBm

10dB/



CENTER 859.0000MHZ

SPAN 100.0KHZ

*RBW 1.0KHZ

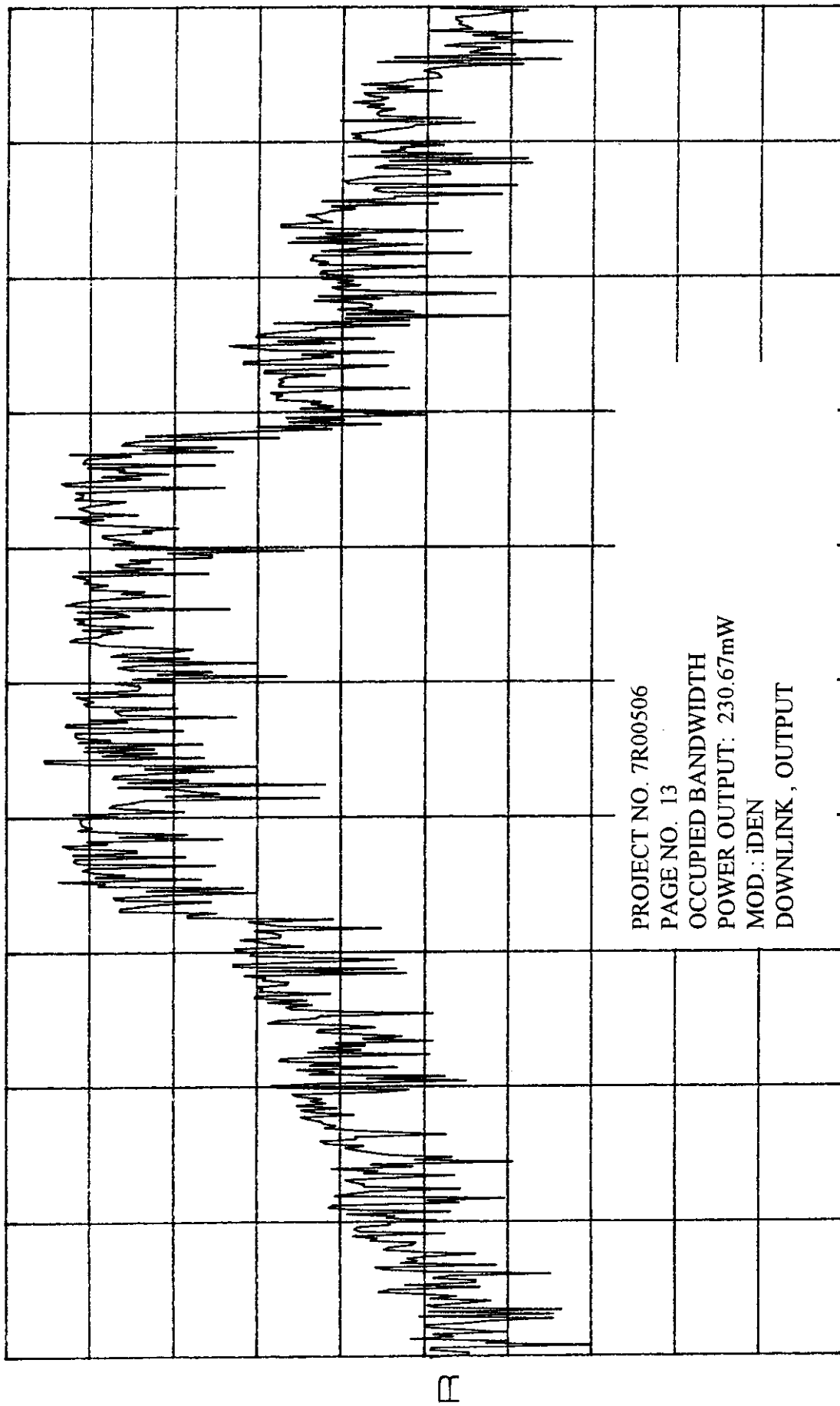
VBW 1.0KHZ

SWP 250ms

ATTEN 10dB

RL 20.0dBm

10dB/



CENTER 859.80000MHZ

SPAN 50.00KHZ

*RBW 300HZ

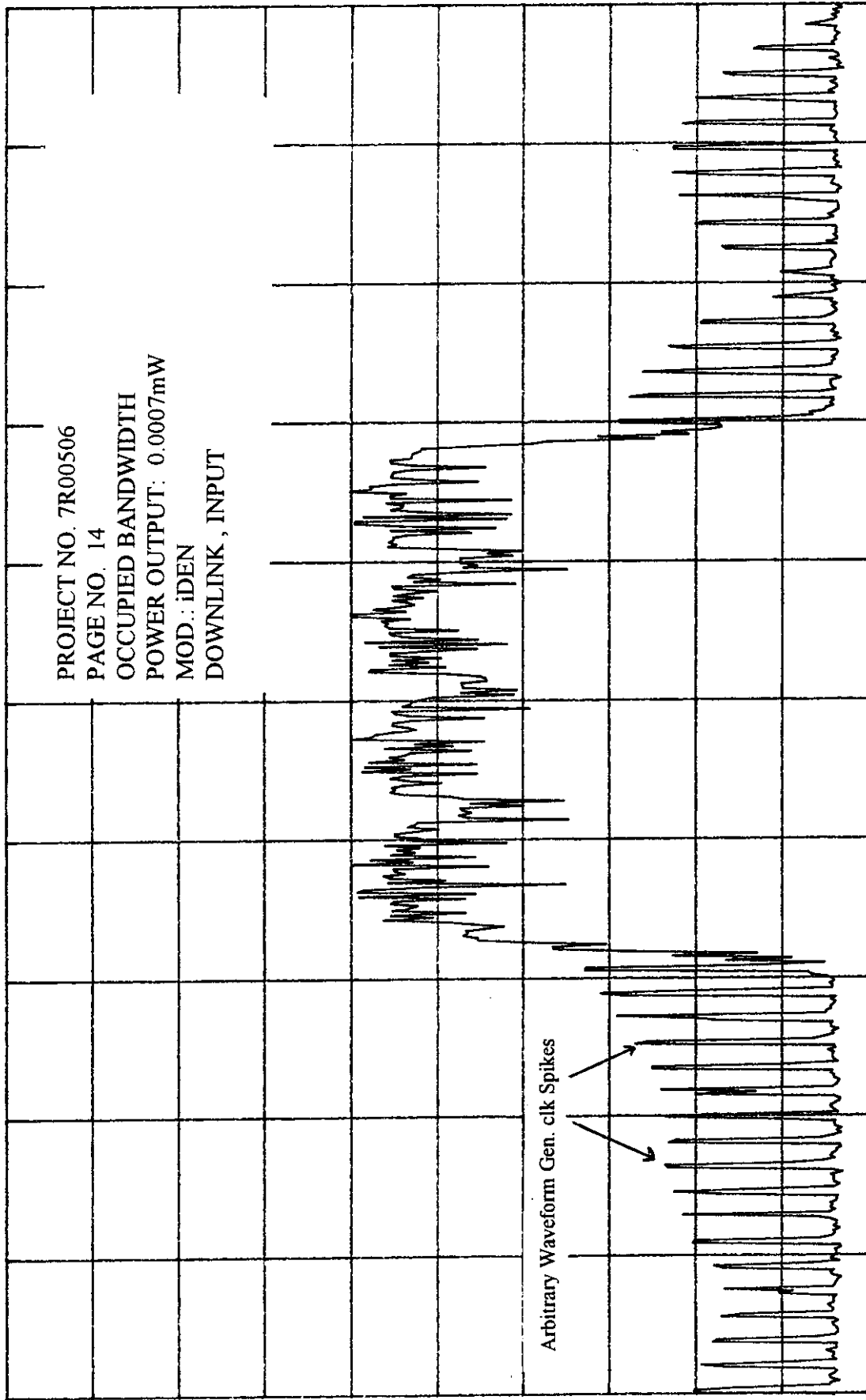
VBW 300HZ

SWP 1.40sec

*ATTEN 0dB

RL 0dBm

10dB/



R

CENTER 859.800000MHZ

SPAN 50.00KHZ

*RBW 300HZ

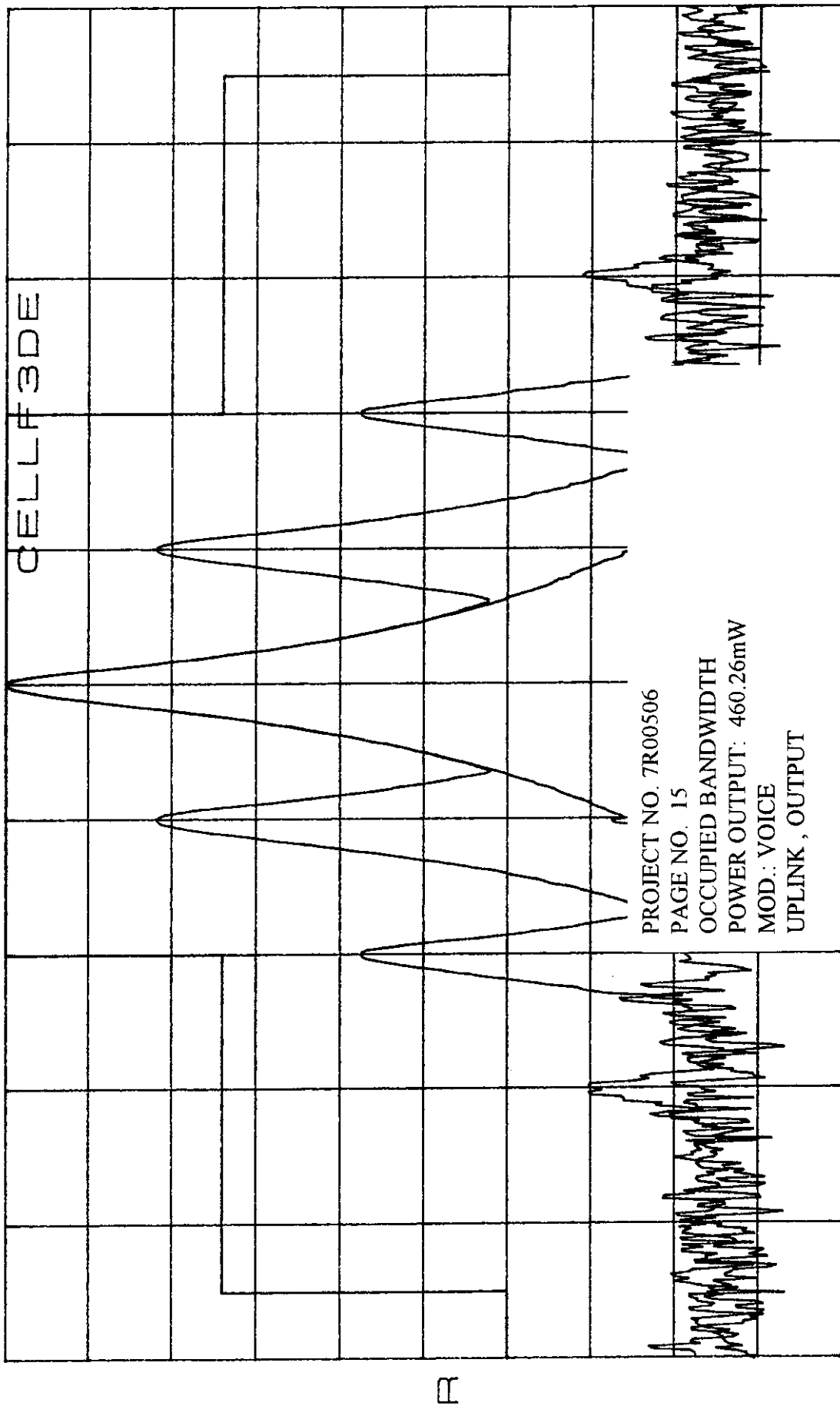
VBW 300HZ

SWP 1.40sec

*ATTEN 10dB

RL 26.6dBm

10dB/



CENTER 814.00003MHZ

SPAN 100.0KHZ

*RBW 1.0KHZ

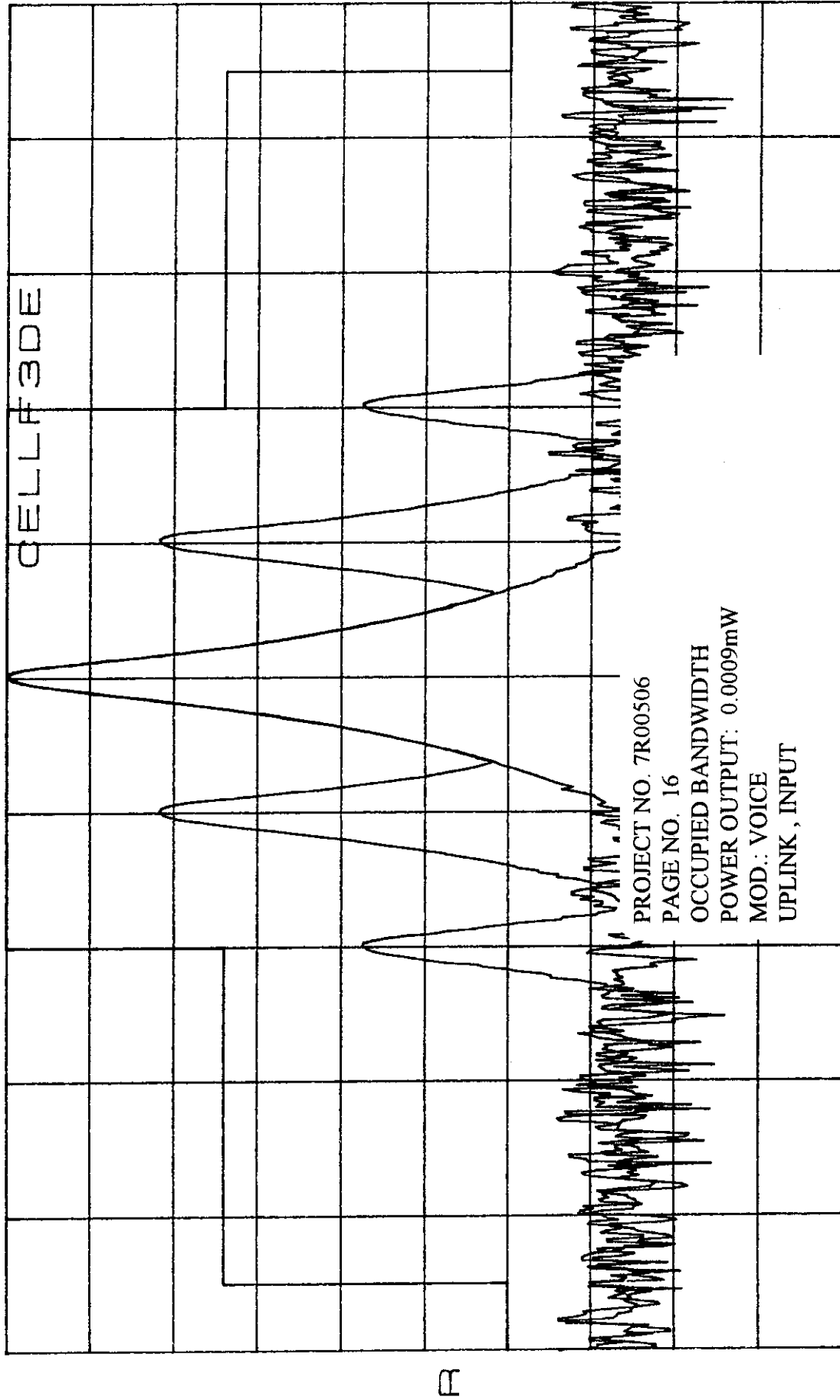
VBW 1.0KHZ

SWP 250ms

*ATTEN 0dB

RL -30.3dBm

10dB/



CENTER 814.00002MHZ

SPAN 100.0KHZ

*RBW 1.0KHZ

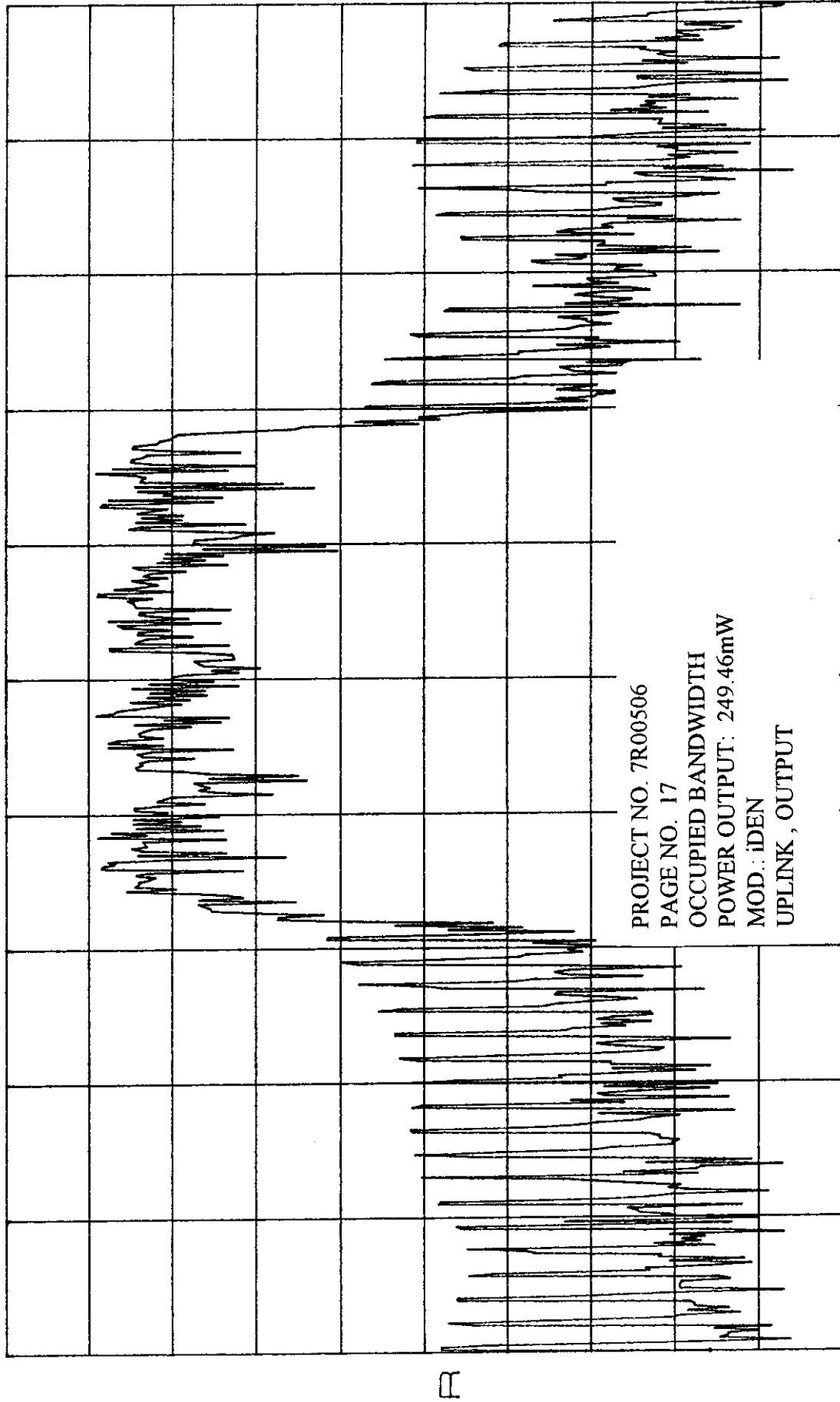
VBW 1.0KHZ

SWP 250ms

ATTEN 10dB

RL 20.0dBm

10dB/



CENTER 814.00000MHZ

SPAN 50.000KHZ

*RBW 300HZ

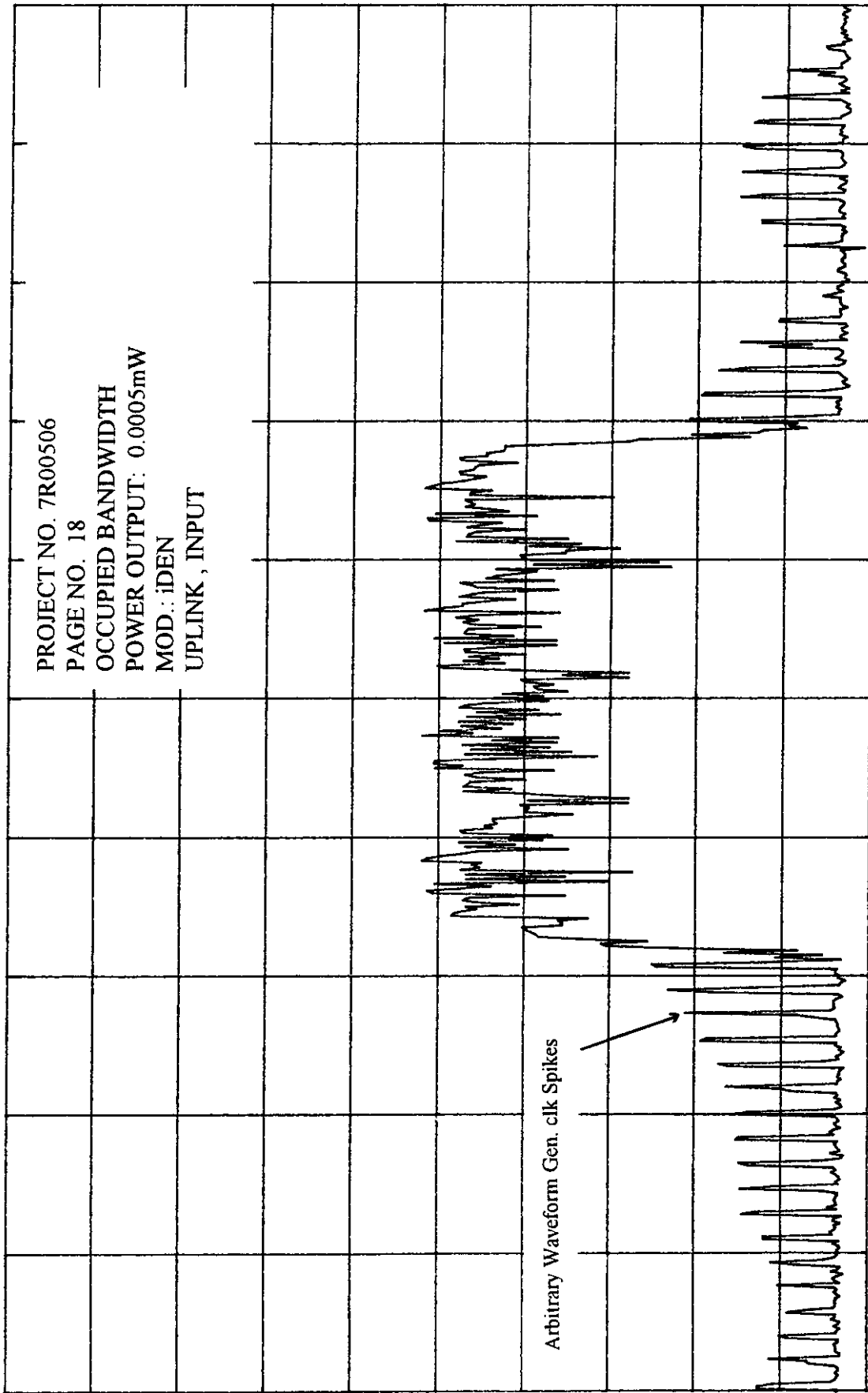
VBW 300HZ

SWP 1.40sec

*ATTEN 0dB

RL 0dBm

10dB/



R

CENTER 814.00000MHZ

SPAN 50.00KHZ

*RBW 300HZ

VBW 300HZ

SWP 1.40sec

*ATTEN 10dB
RL 30.0dBm

MKR -13.00dBm
857.55MHz

10dB/

DISPLAY LINE
-13.0 dBm

D

R

PROJECT NO. 7R00506

PAGE NO. 19

3 FREQUENCY INTERMOD. PRODUCTS

POWER OUTPUT: 380.19mW

MOD.: NONE

DOWNLINK, OUTPUT

START 851.00MHz

STOP 866.00MHz

*RBW 300kHz

VBW 300kHz

SWP 50.0ms

*ATTEN 10dB
RL 30.0dBm

MKR -26.67dBm
2.60GHz

10dB/

DISPLAY LINE
-13.0 dBm

D

R

PROJECT NO. 7R00506
PAGE NO. 20
INTERMODULATION SPURIOUS EMISSIONS
POWER OUTPUT: 380.19mW
MOD.: NONE
DOWNLINK, OUTPUT

START 0HZ
*RBW 300KHZ

STOP 10.00GHZ
VBW 300KHZ SWP 280ms

ATTEN 10dB
RL 30.0dBm

MKR -13.00dBm
809.55MHz

10dB/

DISPLAY LINE
-13.0 dBm

D

R

PROJECT NO. 7R00506

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INTERMODULATION SPURIOUS EMISSIONS

POWER OUTPUT: 460.26mW

MOD.: NONE

UPLINK, OUTPUT

START 806.00MHz

STOP 821.00MHz

*RBW 100kHz

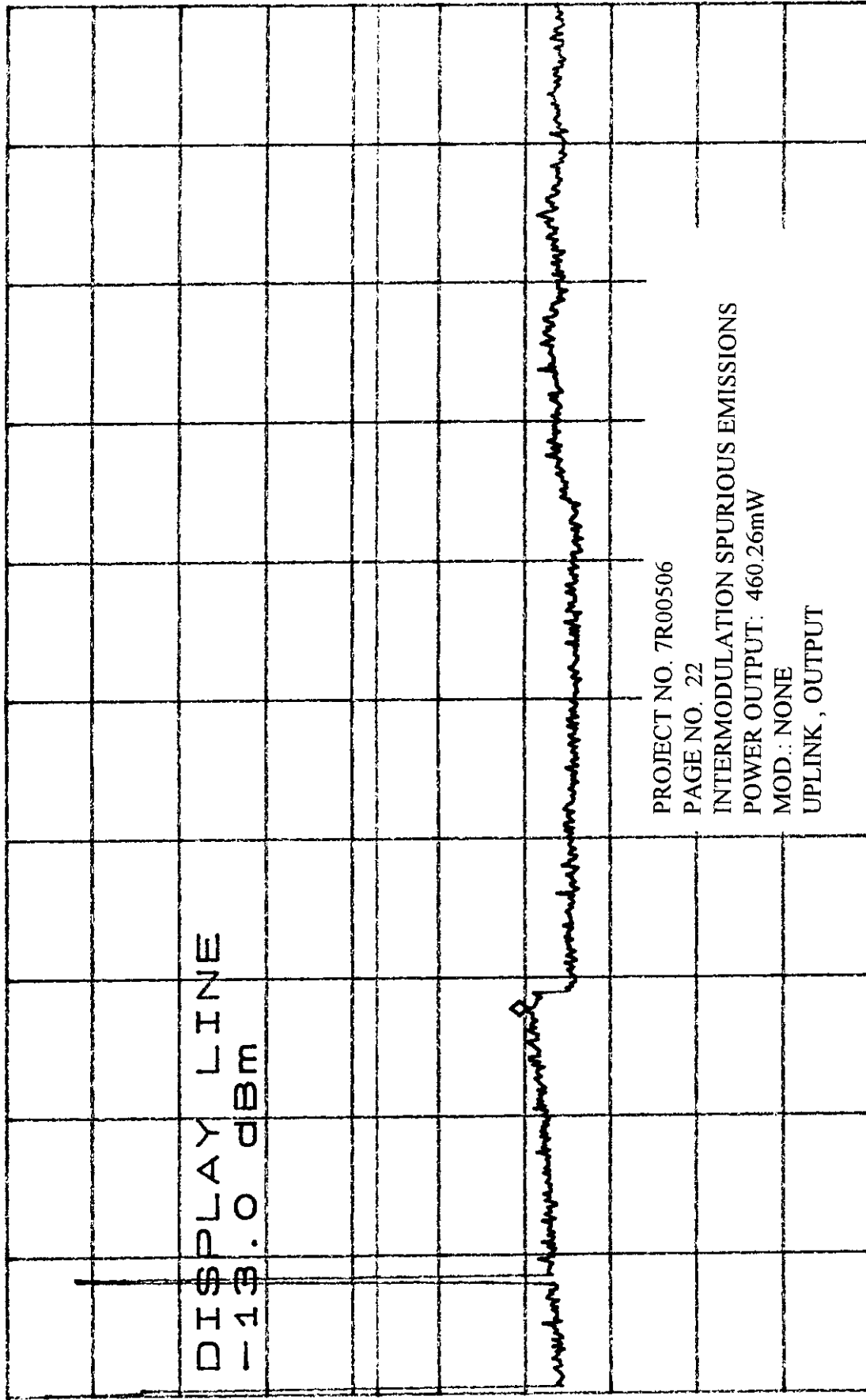
VBW 100kHz

SWP 50.0ms

ATTEN 10dB
RL 30.0dBm

MKR -30.33dBm
2.77GHz

10dB/



DISPLAY LINE
-13.0 dBm

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INTERMODULATION SPURIOUS EMISSIONS

POWER OUTPUT: 460.26mW

MOD: NONE

UPLINK, OUTPUT

START OHZ

STOP 10.00GHz

*RBW 1.0MHz

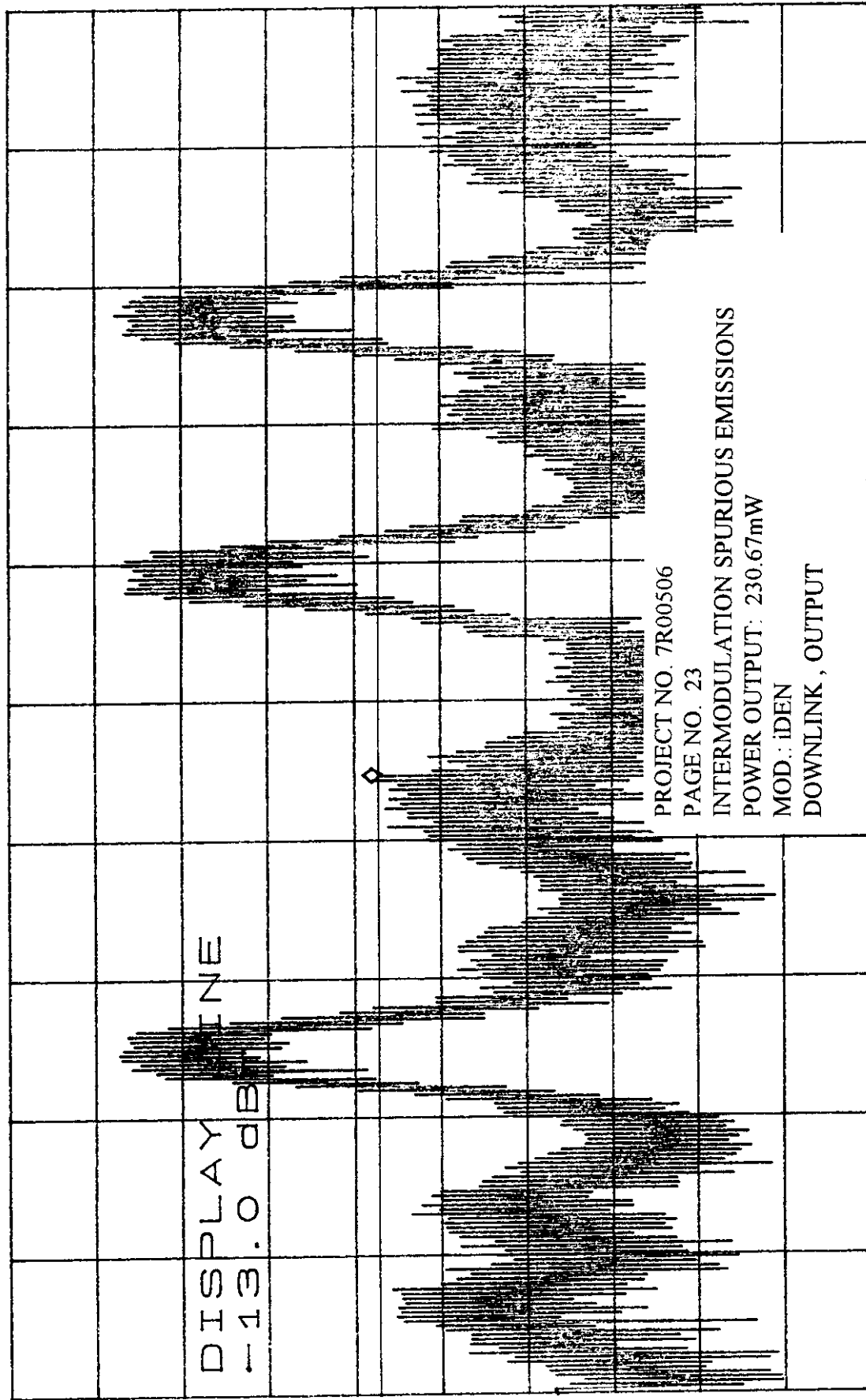
VBW 1.0MHz

SWP 200ms

ATTEN 10dB
RL 30.0dBm

MKR -13.00dBm
857.70MHz

10dB/



R

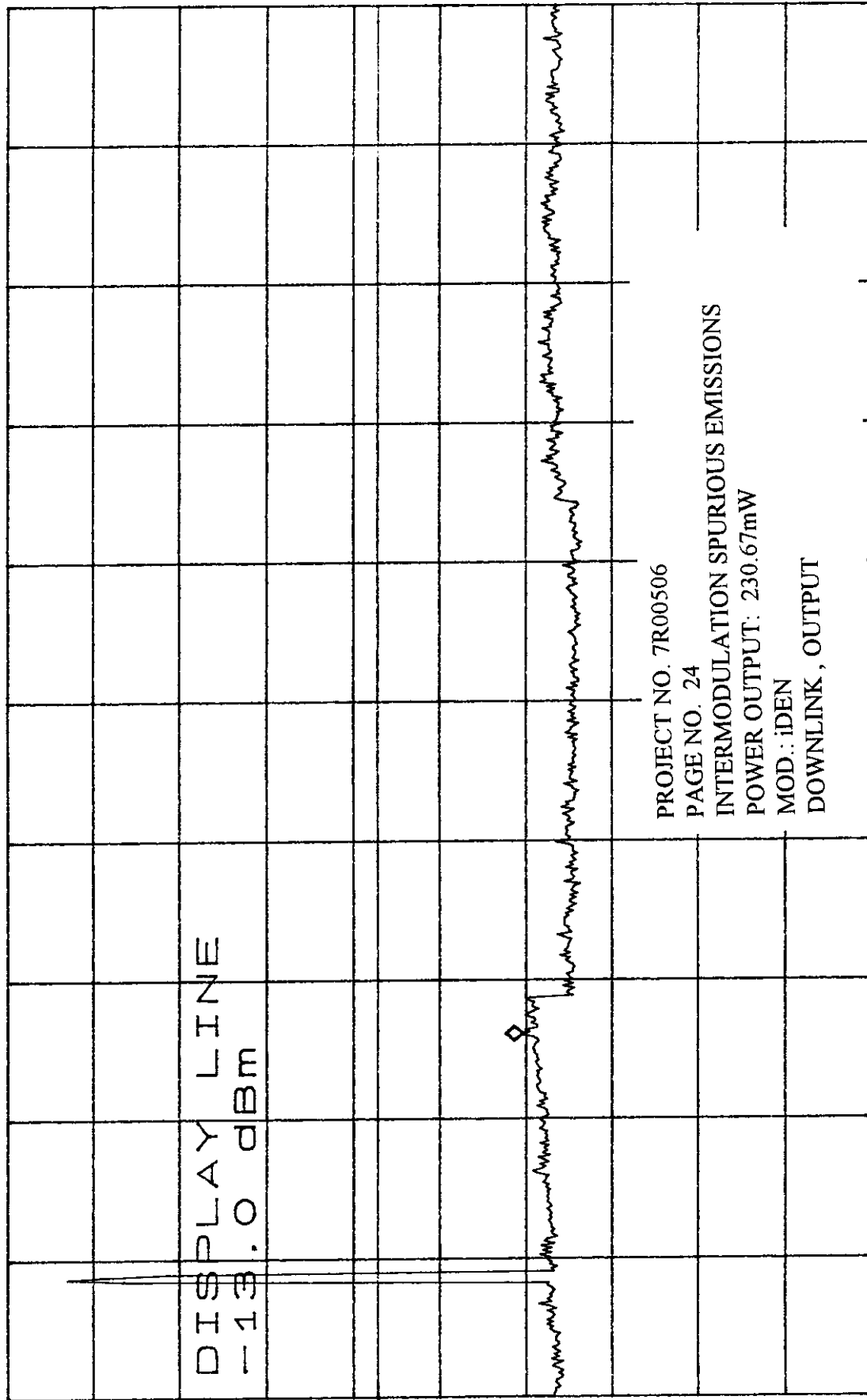
START 851.00MHz
*RBW 100kHz

STOP 866.00MHz
VBW 100kHz
SWP 50.0ms

ATTEN 10dB
RL 30.0dBm

MKR -29.67dBm
2.62GHz

10dB/



D

R

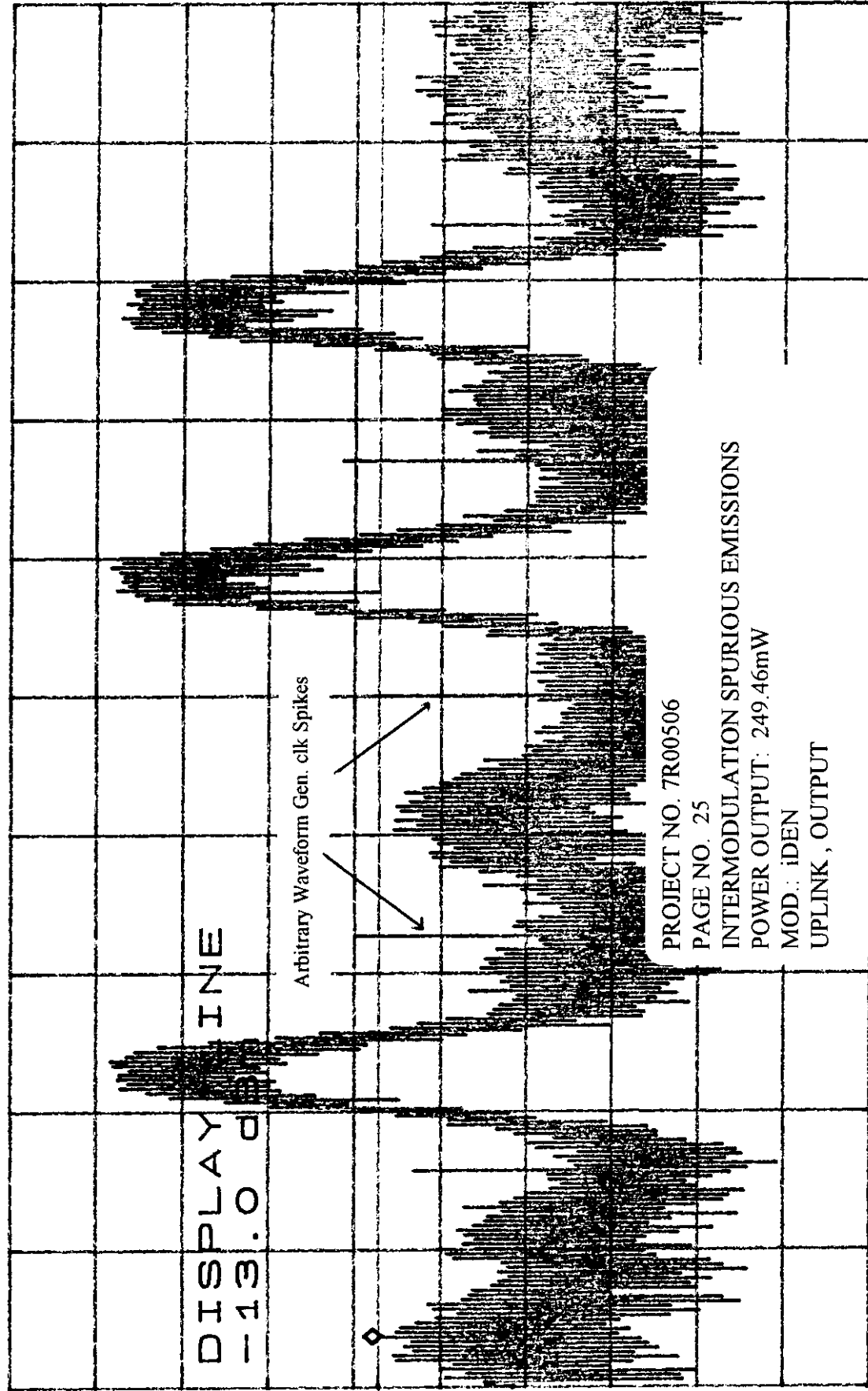
START 0HZ
*RBW 1.0MHZ

STOP 10.00GHZ
VBW 1.0MHZ SWP 200ms

ATTEN 10dB
RL 30.0dBm

MKR -13.17dBm
806.55MHz

10dB/



Arbitrary Waveform Gen. clk Spikes

DISPLAY
-13.0 dBm

PROJECT NO. 7R00506

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INTERMODULATION SPURIOUS EMISSIONS

POWER OUTPUT: 249.46mW

MOD.: iDEN

UPLINK, OUTPUT

START 806.00MHz

STOP 821.00MHz

*RBW 100kHz

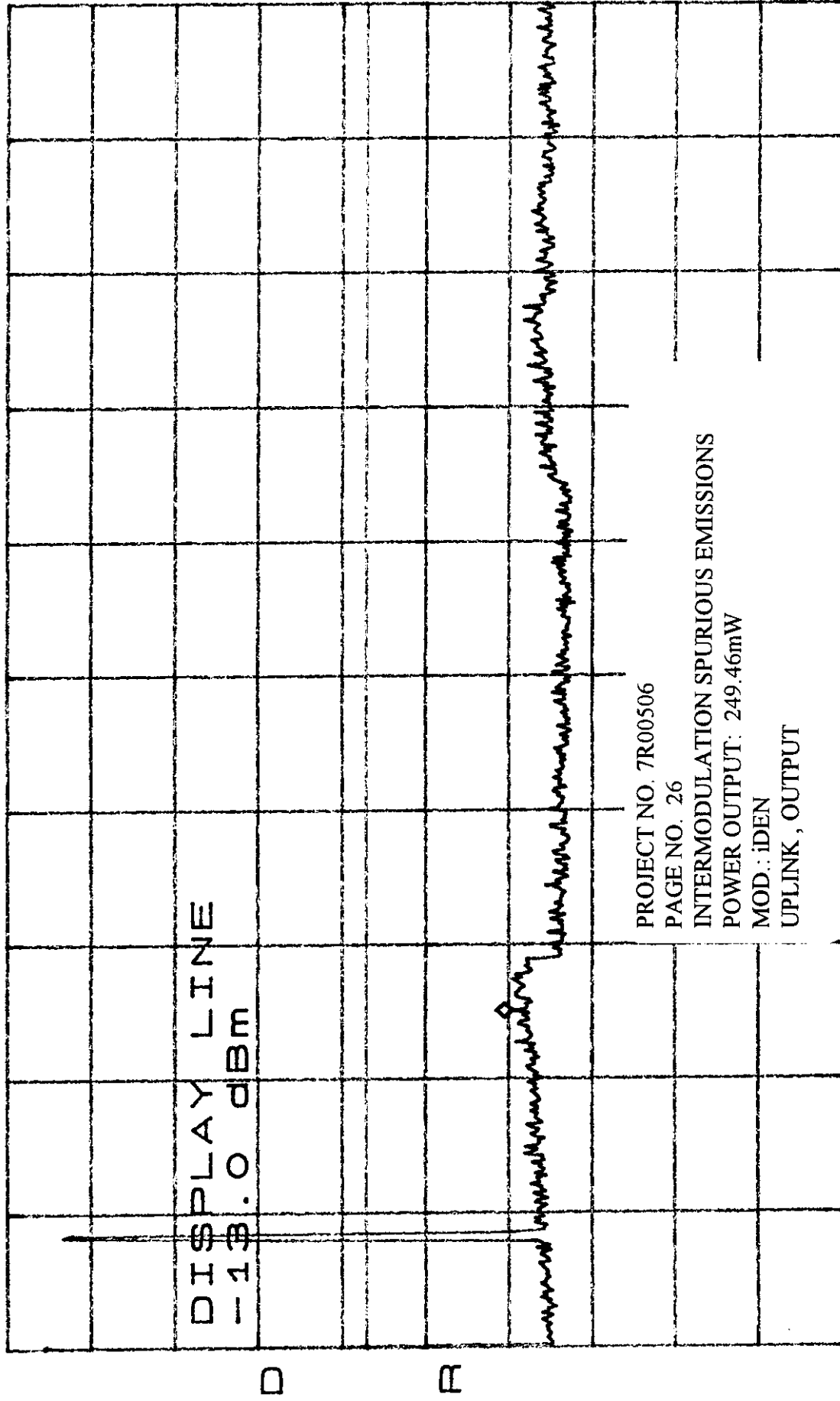
VBW 100kHz

SWP 50.0ms

ATTEN 10dB
RL 30.0dBm

MKR -30.50dBm
2.50GHZ

10dB/



START 0HZ STOP 10.00GHZ
*RBW 1.0MHZ VBW 1.0MHZ SWP 200ms

*ATTEN 0dB

MKR 55.50dB μ V

RL 100.0dB μ V 10dB/

2.68GHz

DISPLAY LINE
82.3 dB μ V

D

R

PROJECT NO. 7R00506

PAGE NO. 27

HORZ. RADIATED EMISSIONS

POWER OUTPUT: 460.26mW

MOD.: NONE

UPLINK

START 0Hz

STOP 10.00GHz

*RBW 1.0MHz

VBW 1.0MHz

SWP 200ms

*ATTEN 0dB

MKR 54.83dBμV

RL 100.0dBμV 10dB/ 3.38GHz

DISPLAY LINE
82.3 dBμV

D

R

PROJECT NO. 7R00506

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VERT. RADIATED EMISSIONS

POWER OUTPUT: 460.26mW

MOD.: NONE

UPLINK

START 0Hz

STOP 10.00GHz

*RBW 1.0MHz

VBW 1.0MHz

SWP 200ms

*ATTEN 0dB

MKR 55.00dB μ V

RL 100.0dB μ V

10dB/

2.67GHz

DISPLAY LINE
82.3 dB μ V

D

R

PROJECT NO. 7R00506

PAGE NO. 29

HORZ. RADIATED EMISSIONS

POWER OUTPUT: 269.15mW

MOD.: NONE

DOWNLINK

START 0Hz

STOP 10.00GHz

*RBW 1.0MHz

VBW 1.0MHz

SWP 200ms

*ATTEN 0dB

MKR 54.67dB μ V

RL 100.0dB μ V 10dB/

2.35GHz

DISPLAY LINE
82.3 dB μ V

D

R

PROJECT NO. 7R00506
PAGE NO. 30
VERT. RADIATED EMISSIONS
POWER OUTPUT: 269.15mW
MOD.: NONE
DOWNLINK

START 0Hz

STOP 10.00GHz

*RBW 1.0MHz

VBW 1.0MHz

SWP 200ms

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
FCC ID: NT3BDA8087

Test Data - Radiated Emissions-Uplink

[illegible]

Notes: Worst case noise floor as measured on the Spectrum Analyzer with Amp in.
Circuit: Horizontal = 54.7 dB μ V/m
Vertical = 55.5 dB μ V/m

* B/C = biconical, B/L biconilog, L/P = log-periodic, H = horn, D/P = dipole
 ** Includes cable loss when amplifier is not used
 *** Includes cable loss
 () Denotes failing emission level.

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
FCC ID: NT3BDA8087

Test Data - Radiated Emissions-Downlink

[illegible]

Notes: Worst case noise floor as measured on the Spectrum Analyzer with Amp in.
Circuit: Horizontal = 54.7 dB μ V/m
Vertical = 55.5 dB μ V/m

* B/C = biconical, B/L biconilog, L/P = log-periodic, H = horn, D/P = dipole
 ** Includes cable loss when amplifier is not used
 *** Includes cable loss
 () Denotes failing emission level.

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

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

MEASUREMENT DATA:

Standard test frequency: _____ MHz

Standard test voltage: _____ Vdc

TIME (MIN)	Frequency (MHz)			
	-30°C	-20°C	-10°C	0°C
0				
0.5				
1.0				
1.5				
2.0				
2.5				
3.0				

TIME (MIN)	Frequency (MHz)			
	+10°C	+20°C	+40°C	+50°C
0				
0.5				
1.0				
1.5				
2.0				
2.5				
3.0				

FREQUENCY VERSUS SUPPLY VOLTAGE

TIME (MIN)	Frequency (MHz)		
	-10% Vdc	Vdc	+10% Vdc
0			
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

RADIO TEST EQUIPMENT LIST

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 9/97	May 9/98	
	Plotter	Hewlett Packard	7470A	2308A30807	NCR	NCR	
1 Year	Radio Test Set	Rohde & Schwarz	CMS 52	840.0009.52	July 23/97	July 23/98	
1 Year	Attenuator	Narda	765-20	9510	July 23/97	July 23/98	
1 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	July 23/97	July 23/98	
1 Year	Insertion Unit	Rohde & Schwarz	URV5-Z4	FA000905	July 23/97	July 23/98	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	50 ohm Combiner Pad	Mini Circuits	ZFC-3-4	922603	Dec. 5/97	Dec. 5/98	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	Sept. 18/97	Sept. 18/98	
1 Year	Arbitrary Waveform Gen.	Sony/Tektronix	AWG2021	J310495	May 15/97	May 15/98	
1 Year	Plotter	Hewlett Packard	7550A	FA001129	NCR	NCR	
3 Year	Signal Generator	Rhode & Schwarz	SME03	DE14439	June 20/96	June 20/96	
3 Year	Signal Generator	Rhode & Schwarz	SME03	DE14510	June 20/96	June 20/96	

NA: Not Applicable

NCR: No Cal Required

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

ANNEX A

TEST METHODOLOGIES

*EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"**FCC ID: NT3BDA8087*

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

TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
Standard Test Voltage: 13.8 VDC
Unmodulated

MINIMUM STANDARD: Para. No. 90.205(d). The maximum allowable station effective radiated power (ERP) is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table I of 90.205(d).

NAME OF TEST:	Audio Frequency Response	PARA.NO.: 2.987(a)
----------------------	---------------------------------	---------------------------

TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
Standard Test Voltage: 13.8 VDC
Modulated

MINIMUM STANDARD TIA/E1A-603, Para. No. 3.2.6 from 300 Hz to 3000 Hz. The transmitter audio frequency response shall have a nominal 6 dB per octave pre-emphasis characteristic.

NAME OF TEST:	Audio Low-Pass Filter Frequency Response	PARA.NO.: 2.987(a)
----------------------	---	---------------------------

TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
Standard Test Voltage: 13.8 VDC

MINIMUM STANDARD: N/A

NAME OF TEST:	Modulation Limiting	PARA.NO.: 2.987(b)
----------------------	----------------------------	---------------------------

TEST CONDITIONS: Standard Temperature & Humidity: ±20°C, 30%
Standard Test Voltage: 13.8 VDC

TEST EQUIPMENT: As per block diagram and equipment list attached.

MINIMUM STANDARD: N/A

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

NAME OF TEST: Occupied Bandwidth

PARA.NO.: 2.989

TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
Standard Test Voltage: 13.8 VDC

MINIMUM STANDARD: Para. No. 90.210, see table 1 below for applicable mask.

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

Table 1

NAME OF TEST: Spurious Emission at Antenna Terminals

PARA.NO.: 2.991

TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
Standard Test Voltage: 13.8 VDC
Modulated: 2500 Hz @ 16 dB overdrive

MINIMUM STANDARD: Para. No. 90.210, see table 1 above for applicable mask.

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
FCC ID: NT3BDA8087

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

TEST CONDITIONS: Outdoor Range: +14°C, 30%
Standard Test Voltage: 13.8 VDC

MINIMUM STANDARD: Para. No. 90.210 see table 1 for applicable mask.

CALCULATION OF FIELD STRENGTH LIMIT

An example of attenuation requirement of $50 + 10 \log P$ is equivalent to -20 dBm (1×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

$G = 1.64$ (Dipole Gain)

$P = 10^{-5}$ Watts (Maximum spurious output power)

$R = 3\text{m}$ (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R} = E = \frac{\sqrt{30 \times 1.64 \times 10^{-5}}}{3} = 0.00739 \text{ V/m} = 77.4 \text{ dB}_{\mu\text{V}}/\text{m}$$

For emissions > 1 GHz:

$G = 1$ (Isotropic Gain)

$P = 1 \times 10^{-5}$ Watts (Maximum spurious output power)

$R = 3\text{m}$ (Measurement Distance)

$$E = 77.4 - 20\log\sqrt{1.64} = 75.3\text{dB}_{\mu\text{V}}/\text{m}@3\text{m}$$

*EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"**FCC ID: NT3BDA8087*

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

TEST CONDITIONS: As per measurement data.

MINIMUM STANDARD: Para. No. 90.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

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

Table 2

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
 FCC ID: NT3BDA8087

NAME OF TEST: Transient Frequency Behaviour	PARA.NO.: 90.214
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TEST CONDITIONS: Standard Temperature & Humidity: +20°C, 30%
 Standard Test Voltage: 13.8 VDC

MINIMUM STANDARD:

Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels

Time intervals ^{1,2}	Maximum Frequency difference ³ (kHz)	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	± 25	5.0	10.0	20.0	5.0	10.0	5.0
t ₂	± 12	20.0	25.0	50.0	20.0	25.0	20.0
t ₃ ⁴	± 25	5.0	10.0	10.0	5.0	10.0	5.0

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels

Time intervals ^{1,2}	Maximum Frequency difference ³ (kHz)	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	± 12.5 / ± 6.25	5.0	10.0	20.0
t ₂	± 6.25 / ± 3.125	20.0	25.0	50.0
t ₃ ⁴	± 12.5 / ± 6.25	5.0	10.0	10.0

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

ANNEX B

TEST METHODOLOGIES

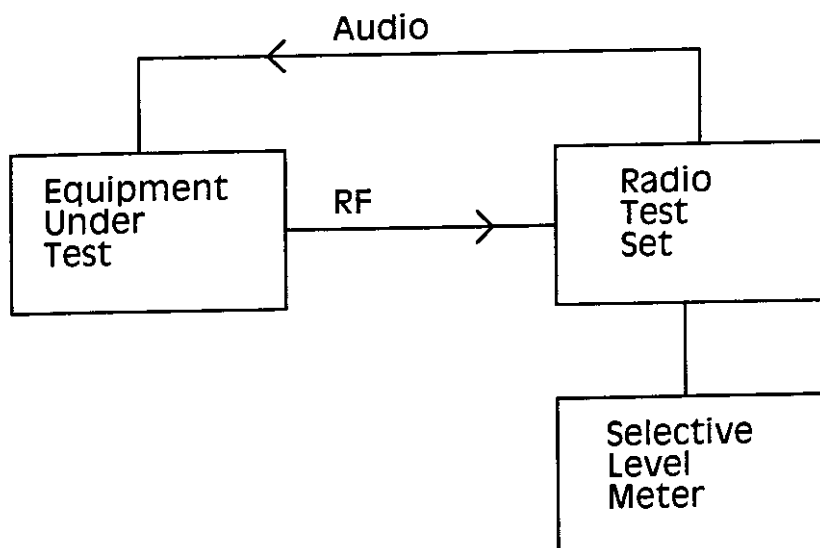
EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

PARA. NO. 2.985 RF POWER OUTPUT



PARA. NO. 2.987(a) AUDIO FREQUENCY RESPONSE



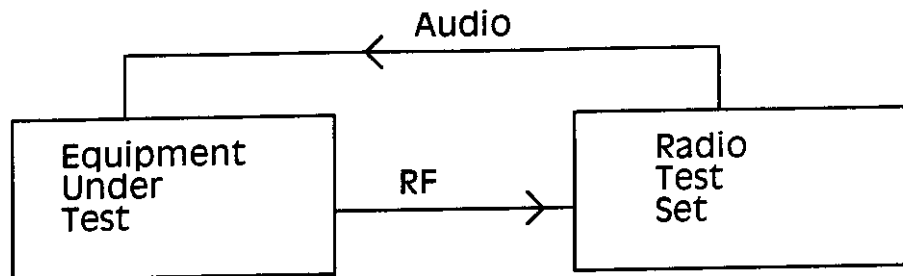
PARA. NO. 2.987(a) AUDIO LOW-PASS FILTER FREQUENCY RESPONSE



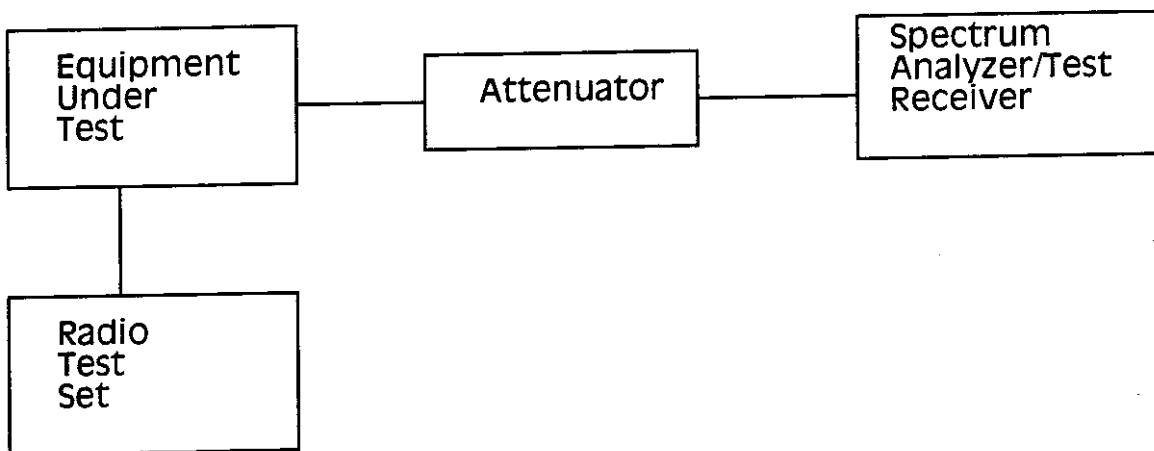
EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

PARA. NO. 2.987(b) MODULATION LIMITING



PARA. NO. 2.989 OCCUPIED BANDWIDTH



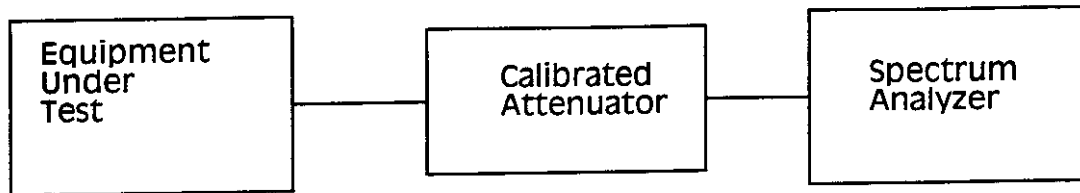
The transmitter was modulated with a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50% modulation.

Spectrum Analyzer settings as per measurement data.

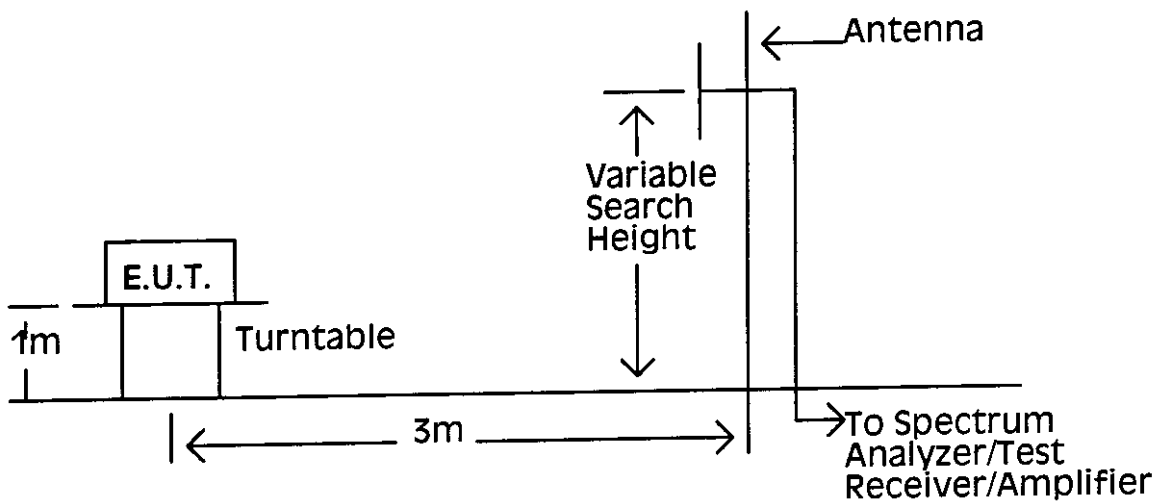
EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

PARA. NO. 2.991 SPURIOUS EMISSIONS AT ANTENNA TERMINALS



PARA. NO. 2.993 FIELD STRENGTH OF SPURIOUS RADIATION



Frequency Range

<1300 MHz

Test Receiver Settings

120 kHz BW

Peak Detector

>1300 MHz

Spectrum Analyzer Settings

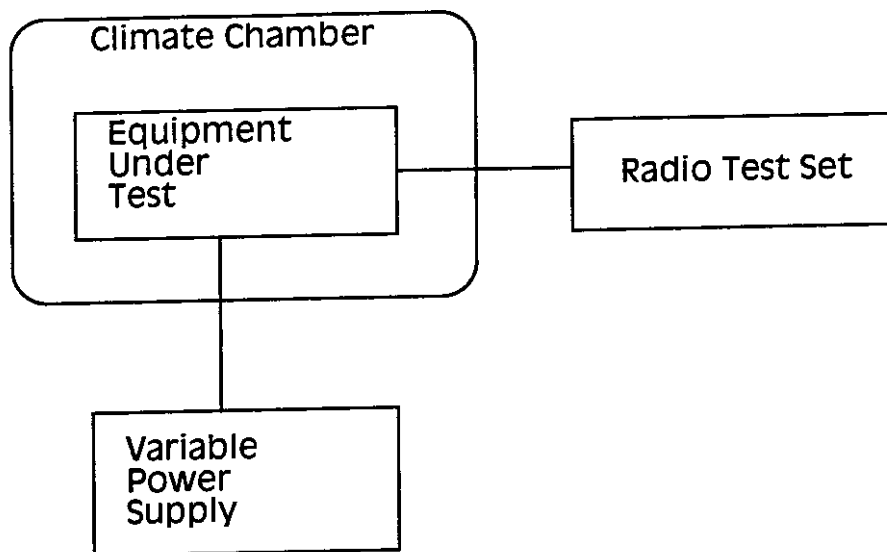
30 kHz RBW

200 kHz Span

20 mS Sweep Rate

EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"
FCC ID: NT3BDA8087

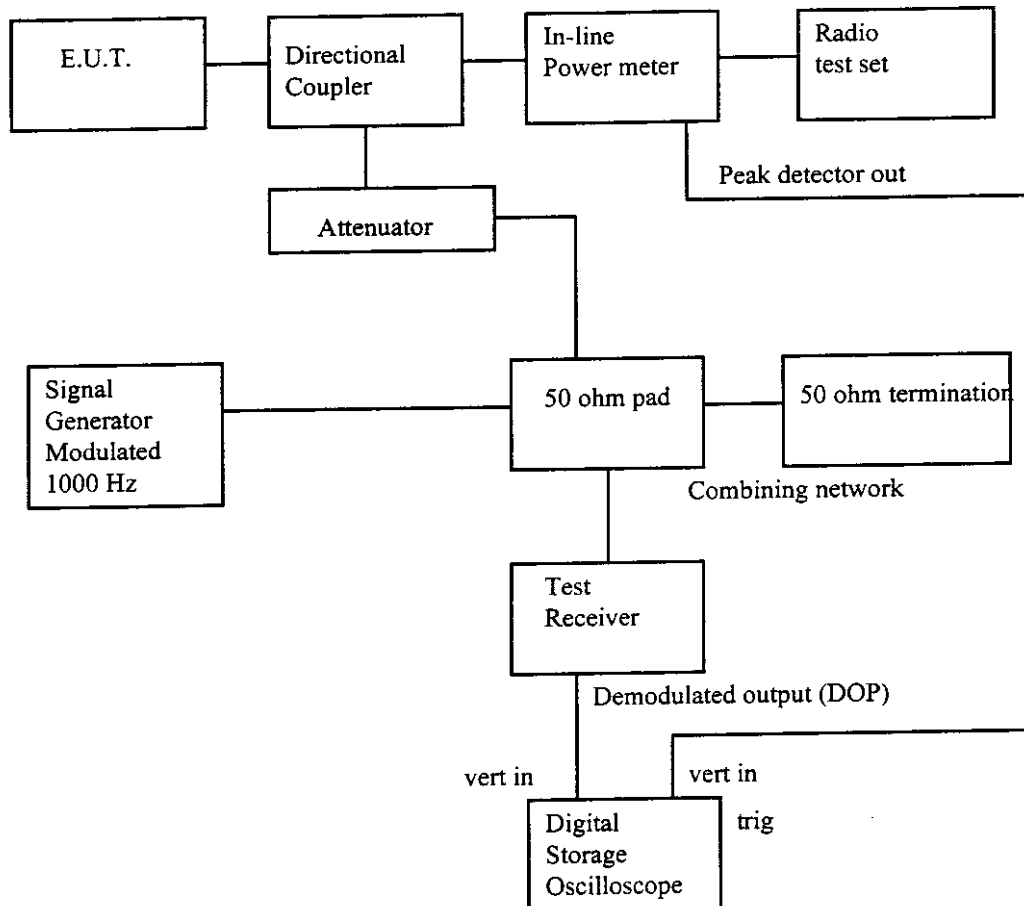
PARA. NO. 2.995 FREQUENCY STABILITY



EQUIPMENT: The Communications Components Inc. "Bi-Directional Amplifier"

FCC ID: NT3BDA8087

PARA. NO. 90.214 TRANSIENT FREQUENCY BEHAVIOUR



Voice

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

Data

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).