

June 16, 2001

Elite Electronic Engineering, Inc.
1516 Center Circle
Downers Grove, IL 60515

Attn: Richard King

Dear Richard:

Enclosed you will find a certification application for a Bidirectional Amplifier, Model No. 510, FCC ID: NVRC510-03. Certification is requested under FCC Parts 2 & 24. This application is being filed by Retlif Testing Laboratories on behalf of Cellular Specialties. The applicable filing fee and certification agreement have been mailed to your attention.

I trust that you will find this application to be complete; however, should you have any questions or require any additional information, please feel free to contact us.

Very truly yours,

RETLIF TESTING LABORATORIES

Scott Wentworth
Manager
Enc. (as stated)

CERTIFICATION APPLICATION

Applicant/Manufacturer: **Cellular Specialties
670 North Commercial Street
Manchester, NH 03101**

Equipment under Test (EUT): **The EUT is a Bidirectional Amplifier used to amplify cellular signals in the PCS Band.**

Model: **510pcs**

FCC ID Number: **FCC ID: NVRC SI510-03**

Applicable Test Standard: **FCC Part 2
FCC Part 24, Subpart E**

Device Classification: **Mobile**

EUT Frequency Range: **Uplink: 1850MHz to 1865MHz
Downlink: 1930MHz to 1945MHz**

EUT Gain: **Uplink: 62dB
Downlink: 62dB**

*Measured Power Output
@ 1dB Compression Point:* **Uplink: +32dBm
Downlink: +31dBm**

Protocols used with this device: **TDMA, CDMA & GSM**

*Power Output Rating Based
on Intermodulation Data
(For Certification Grant):* **Uplink: 200mW
Downlink: 200mW**

RF Exposure + Antenna Installation: **See Attached Installation/Users Manual and MPE Evaluation**

Power Ratings Per Channel: **See Section 1**

Measurements Required by FCC: **See Report Section 2 (Summary of Test Program)
and the following Test Report Data Attachments:**

- RF Power Output**
- Intermodulation Characteristics**
- Occupied Bandwidth**
- Spurious Emissions at Antenna Terminals**
- Field Strength of Spurious Radiation**
- Frequency Stability**

Test Report No. R-3767N
FCC ID: NVRC SI510-03

SECTION 1

ACTUAL POWER RATINGS PER CHANNEL:

<u># Channels</u>	<u>Uplink (dBm)</u>	<u>Downlink (dBm)</u>
1	23.0	23.0
2	19.0	19.0
3	16.7	16.7
4	15.0	15.0
5	13.7	13.7
6	12.7	12.7
7	11.8	11.8
8	11.0	11.0
9	10.3	10.3
10	9.7	9.7
11	9.2	9.2
12	8.7	8.7
13	8.2	8.2
14	7.8	7.8
15	7.4	7.4
16	7.0	7.0
17	6.6	6.6
18	6.3	6.3
19	6.0	6.0
20	5.7	5.7

SECTION 2
SUMMARY OF TEST PROGRAM

POWER OUTPUT

Measurement Procedure:

The uplink and downlink of the test sample were alternately connected through external attenuators to a spectrum analyzer. Each link had an unmodulated signal sent to the input. The level of the input signal was adjusted to achieve maximum output power of the amplifier.

Testing was performed at 3 frequencies (low, mid and high) within each passband (uplink and downlink). The levels of the input signals and maximized output power levels were recorded and are shown below.

UPLINK (Power Input @ 1dB Gain Compression Point):

Frequency (MHz)	Input (dBm)	Output (dBm)
1850	-31.4	29.8
1857.5	-30.4	31.3
1865	-27.6	32.4

DOWNLINK (Power Input @ 1dB Gain Compression Point):

Frequency (MHz)	Input (dBm)	Output (dBm)
1930	-30.3	30.9
1937.5	-31.3	30.3
1945	-31.2	29.9

For complete test data, see electronic Test Report Attachment, **RF Power Output Data**.

INTERMODULATION CHARACTERISTICS

Measurement Procedure:

Three CW signals were injected, in turn, to the uplink and downlink via a three way power combiner. Two signals were close together and at the low end of the passband, one signal was close to the high end of the passband. The output of each signal generator was adjusted so that the three output fundamental frequencies were equal in magnitude. At the input power levels used all intermodulation products were at -13dBm or below. The requested power rating of the device for the certification grant is derived by summing the levels of the three input signals for each the uplink and downlink.

For complete test data, including actual X/Y plots of intermodulation signals, see electronic Test Report Attachment, **Intermodulation Characteristics Data**.

OCCUPIED BANDWIDTH

Measurement Procedure:

The signal generator output was connected to the spectrum analyzer. A CDMA modulation signal was then applied to the carrier. Waveforms were then noted on an X-Y plot. Next, the signal generator was connected to the EUT and the output of the EUT was connected to the spectrum analyzer. The output waveforms after amplification were then compared to the emission mask requirements for CDMA signals (46dB down at plus and minus 1 channel spacing 1.25MHz). This procedure was repeated for TDMA modulation utilizing the emission mask requirement of 46dB down at plus and minus 1 channel spacing (30kHz) and for GSM modulation utilizing the emission mask requirement of 46dB down at plus and minus 1 channel spacing (200kHz). Testing was performed at one frequency in the middle of each passband (uplink and downlink).

For complete test data, see electronic Test Report Attachment, **Occupied Bandwidth Data**.

An explanation of the data is as follows: There are two signals superimposed on each plot, one signal is the waveform before modulation, the other is the modulated carrier. In each case the center of the grid shows a narrowband signal projecting out from the center of the modulation envelope. This signal is actually the stored unmodulated signal.

ANTENNA CONDUCTED EMISSIONS

Measurement Procedure:

The signal generator output was connected in turn to the uplink and downlink input ports of the EUT. The input power level was at the level which was ascertained during the Power Output test. A spectrum analyzer was connected to the output of the EUT. The input test frequency used was one frequency in the middle of each passband (uplink and downlink). The level of any spurious emission was recorded. Testing was performed in the frequency range of 30MHz to 20GHz. The spurious emissions limit is -13dBm as specified in FCC Part 24.

For complete test data, including harmonic and spurious emissions measured at antenna terminal, see electronic Test Report Attachment, **Antenna Conducted Data**.

EFFECTIVE RADIATED POWER OF SPURIOUS RADIATION

Measurement Procedure:

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed test site. A signal generator was connected to the uplink input of the amplifier. The signal generator output was set to provide the input power level necessary to achieve maximum output power of the amplifier at one frequency within the middle of each passband (uplink and downlink). The effective radiated power of each out of band spurious emission was measured using the substitution method specified in TIA/EIA-603. The frequency range of the test was 30MHz - 20GHz. The limit for out of band emissions is -13dbm as specified in Part 24.

For complete test data, see electronic Test Report Attachment, **Radiated Emissions Data**.

FREQUENCY STABILITY MEASUREMENTS

Measurement Procedure (Frequency vs. Voltage):

The RF output of the signal generator was connected to the input (uplink and downlink) of the test sample, and the output was connected to a spectrum analyzer. The input signal level was varied. Measurements were taken with the EUT supplied with signals at levels -15, -30, and -60 dB from the maximum input power.

For complete test data, see electronic Test Report Attachment, **Frequency Stability Data**.

**SECTION 3
EQUIPMENT LISTS**

RF Power Output

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3008	Signal Generator	Gigatronics	50 MHz - 18 GHz	900/0.05-18	10/11/00	10/11/01
4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	10/2/00	10/2/01
4963	Attenuator	Hewlett Packard	DC - 18 GHz	8491A	10/19/00	10/19/01
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ES126	5/9/01	5/9/02

Occupied Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	1/31/01	1/31/02
N/A	Signal Generator	Agilent Technologies	TDMA/CDMA/GSM	E4431B	8/24/00	8/24/01

Spurious Emissions at the Antenna Terminals

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	1/31/01	1/31/02
4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	10/2/00	10/2/01
5001	Sweep Oscillator	Hewlett Packard	.01 - 20.4 GHz	8350B	2/23/01	2/23/02

Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3116	Pre-Amplifier	Miteq	0.1 GHz - 18 GHz	AFS42-35	11/7/00	11/7/01
3117	Power Supply	B&K Precision	0-30 Vdc, 3.0 A	1630	2/23/01	2/23/02
3119	Pre-Amplifier	Mini-Circuits	100kHz - 1GHz	ZFL-1000	7/11/00	7/11/01
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	5/6/01	5/6/02
4202	Biconilog	EMCO	26 MHz - 2 GHz	3142	7/10/00	7/10/01
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	1/31/01	1/31/02
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ES126	5/9/01	5/9/02
5001	Sweep Oscillator	Hewlett Packard	.01 - 20.4 GHz	8350B	2/23/01	2/23/02

Frequency Stability

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	1/31/01	1/31/02
4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	10/2/00	10/2/01
5001	Sweep Oscillator	Hewlett Packard	.01 - 20.4 GHz	8350B	2/23/01	2/23/02

Test Report No. R-3767N
FCC ID: NVRCSI510-03

SECTION 3**(Continued)****Intermodulation Characteristics**

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3008	Signal Generator	Gigatronics	50 MHz - 18 GHz	900/0.05-18	10/11/00	10/11/01
385	Sweep Oscillator	Hewlett Packard	1.0 - 18.0 GHz	8620C	1/8/01	1/8/02
385B	Signal Generator	Hewlett Packard	.01 - 2.4 GHz	86222B	1/8/01	1/8/02
4963	Attenuator	Hewlett Packard	DC - 18 GHz	8491A	10/19/00	10/19/01
5001	Oscillator Plug-In	Hewlett Packard	.01 - 20 GHz	83592A	2/23/01	2/23/02
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ES126	5/9/01	5/9/02

Test Report No. R-3767N
FCC ID: NVRCSI510-03

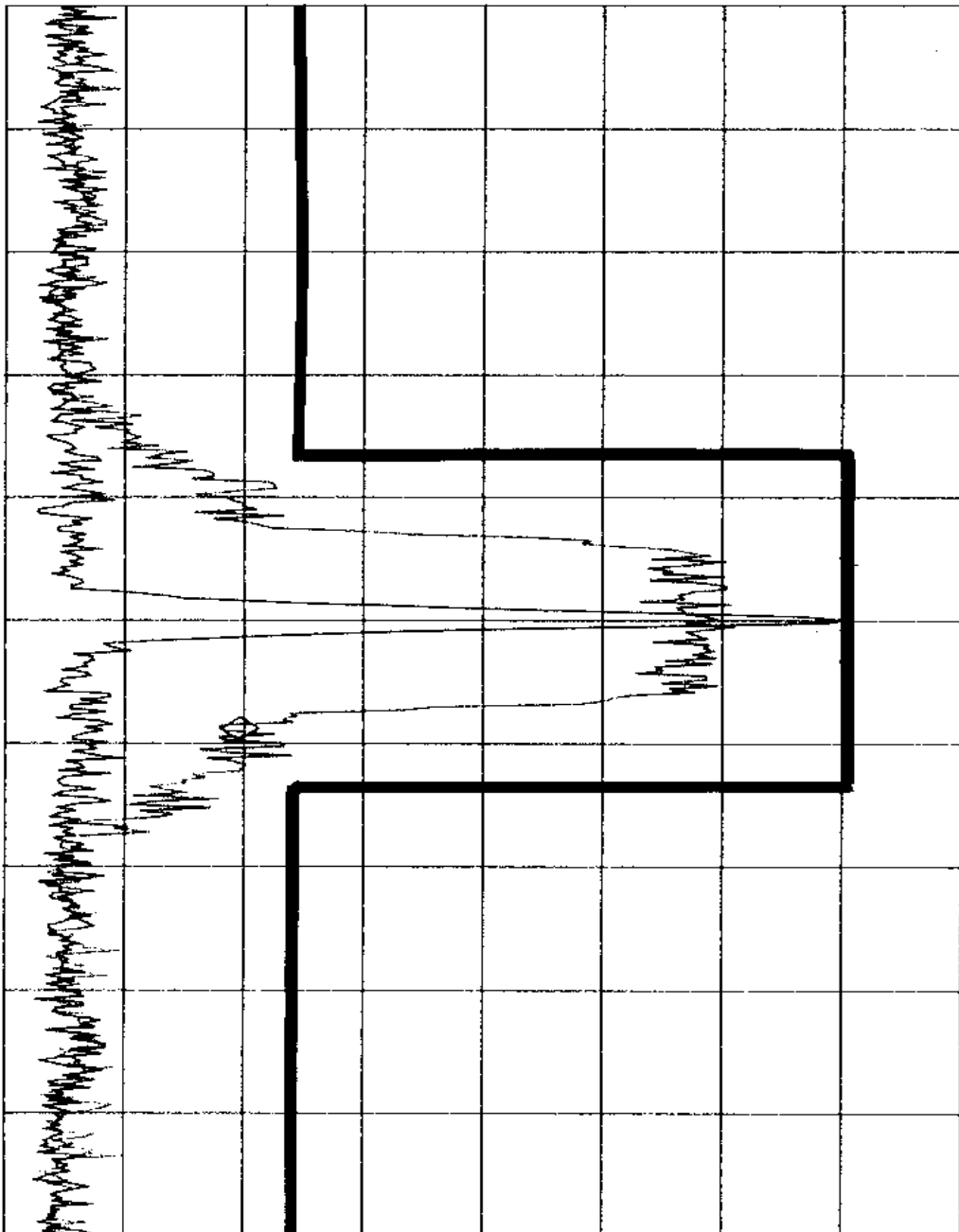
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REF . 0 DBm #AT 20 DB

MKR 1.85838 GHz
-62.00 DBm

PEAK
LOG
10
DB/

VA VB
SC FC
CORR



CENTER 1.85750 GHz
#RES BW 30 KHZ
VBW 100 KHZ
SPAN 10.00 MHZ
SWP 33.3 msec

Customer:	Cellular Specialties, Inc.
Test Sample:	Bidirectional Amplifier
Model No:	510PCS
Test Method:	Occupied Bandwidth, FCC Part 2, para 2.1049
Notes:	Uplink Frequency 1.8575 GHz Modulation: CDMA

Date: 4/20/01 Tech: T. Firkowski Sheet 1 of 6

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Report No. R-3767N

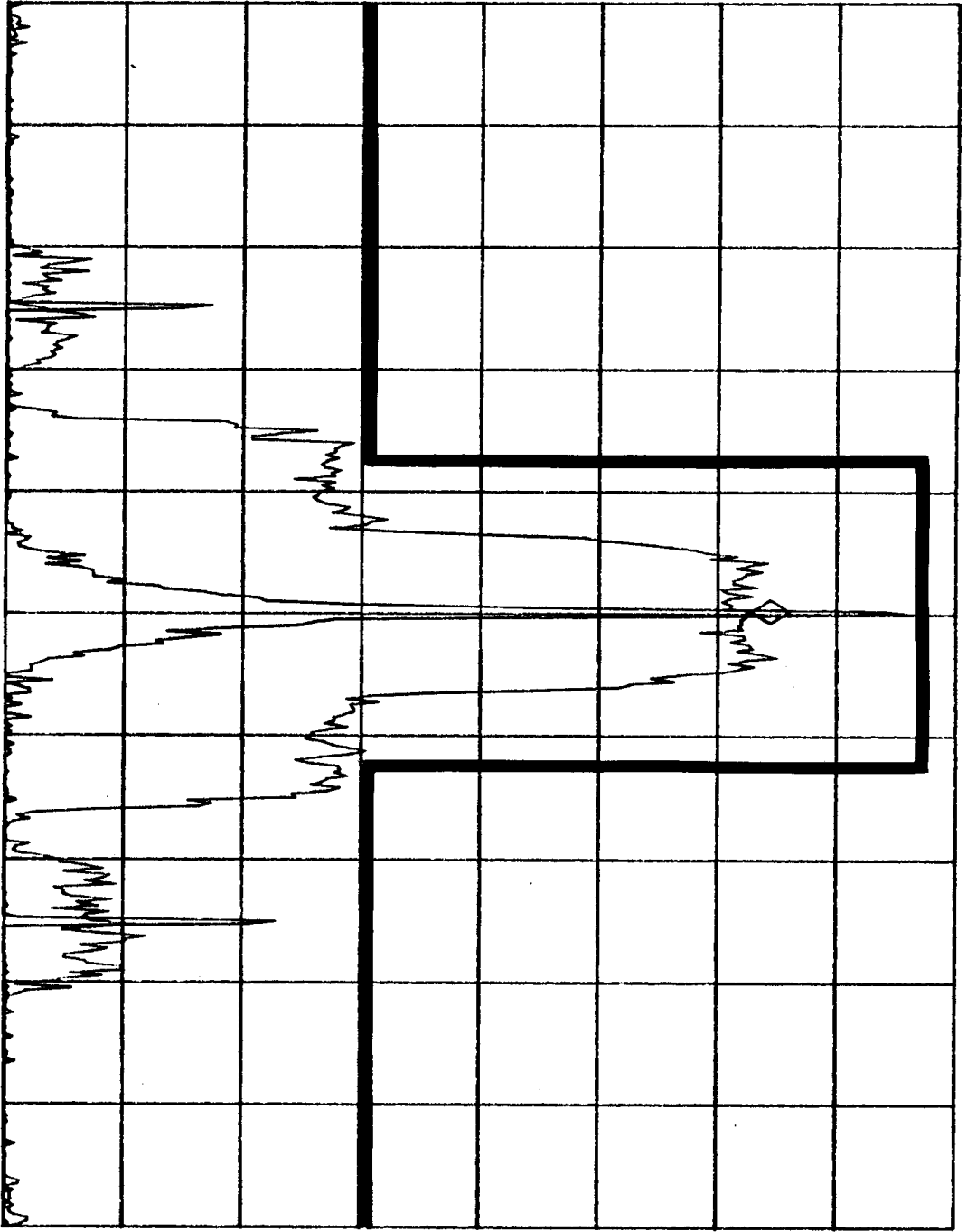
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REF . 0 dBm #AT 20 dB

MKR 1.8574994 GHz
-17.23 dBm

PEAK
LOG
10
dB/

V A V B
S C F C
C O R R



CENTER 1.8575000 GHz
#RES BW 300 Hz
V B W 1 kHz
SPAN 250.0 kHz
S W P 8.33 sec

Customer:	Cellular Specialties, Inc.
Test Sample:	Bidirectional Amplifier
Model No:	510PCS
Test Method:	Occupied Bandwidth, FCC Part 2, para 2.1049
Notes:	Uplink Frequency 1.8575 GHz Modulation: TDMA

Retlif Testing Laboratories	
Report No.	R-3767N

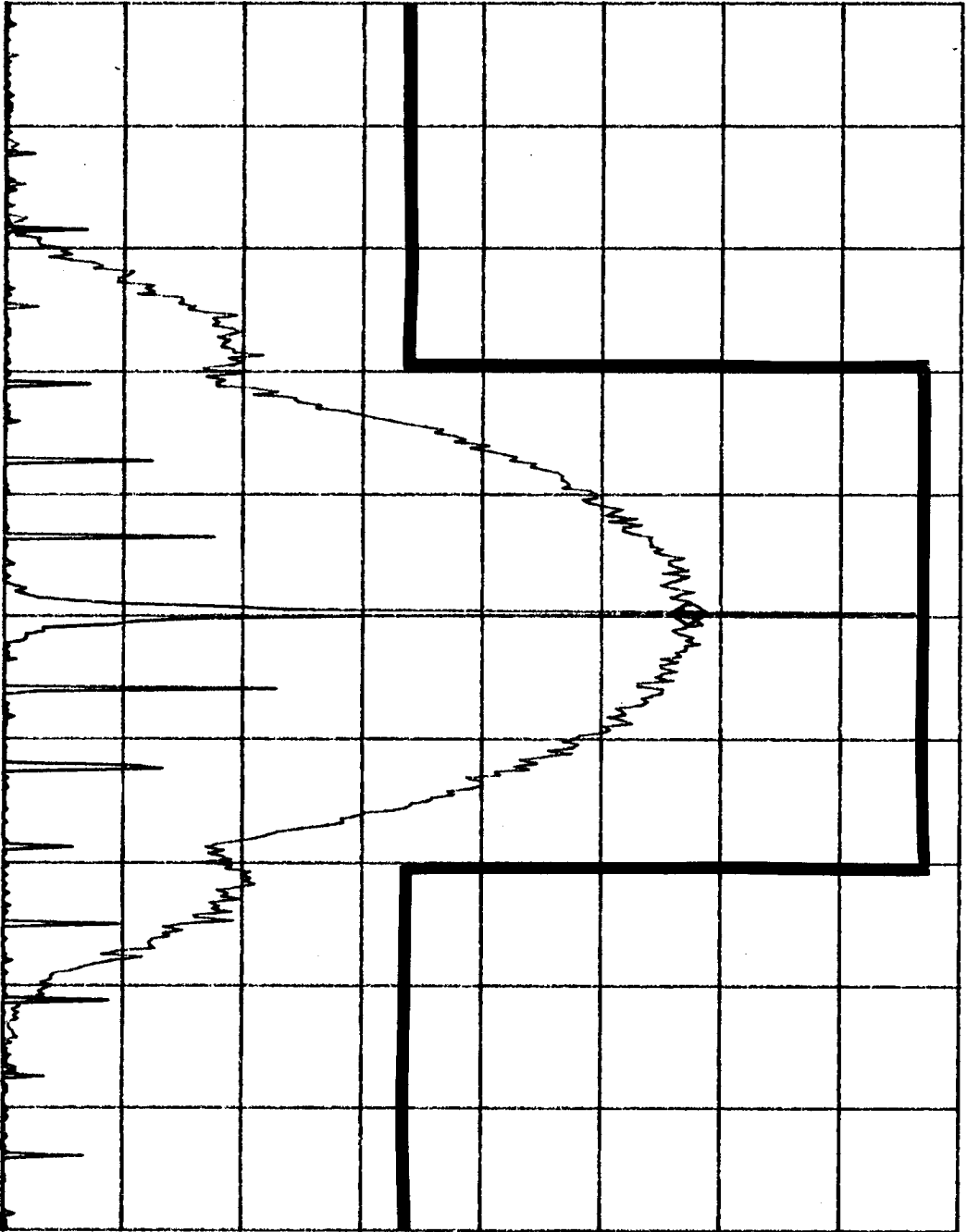
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REF . 0 DBm #AT 20 DB

MKR 1.857498 GHz
-24.28 DBm

PEAK
LOG
10
DB/

VA VB
SC FC
CORR



CENTER 1.857500 GHz
#RES BW 300 Hz

VBW 1 kHz

SPAN 1.000 MHz
SWP 33.3 sec

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Occupied Bandwidth, FCC Part 2, para 2.1049
 Notes: Uplink Frequency 1.8575 GHz
 Modulation: GSM

Date: 4/20/01 Tech: T. Firkowski Sheet 3 of 6

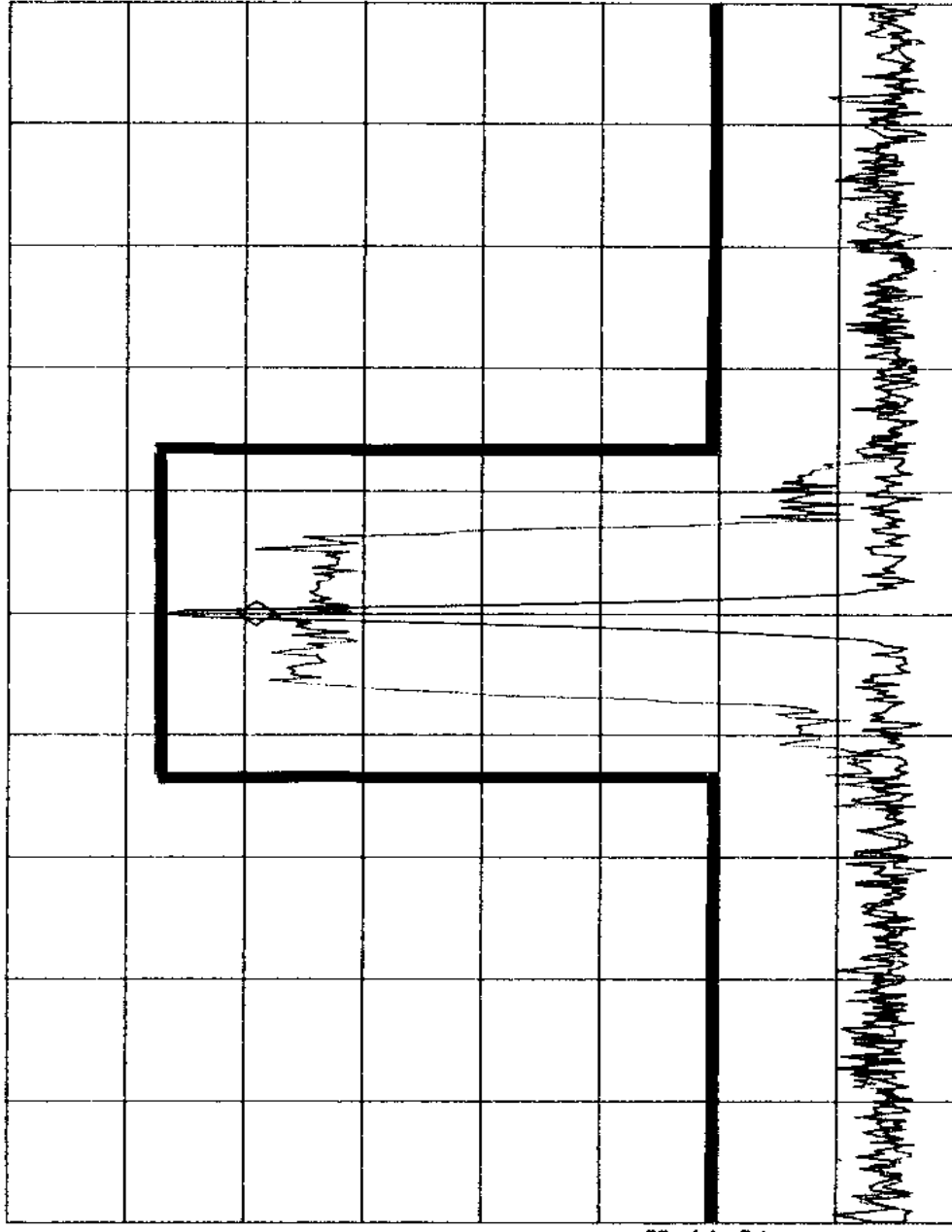
Retlif Testing Laboratories

Report No. R-3767N

10:58:48 APR 20, 2001

MKR 1.93750 GHz
-22.57 dBm

REF . 0 dBm #AT 20 dB



PEAK
LOG
10
dB/

VA VB
SC FC
CORR

CENTER 1.93750 GHz
#RES BW 30 KHZ
SPAN 10.00 MHz
SWP 33.3 msec
VBW 100 KHZ

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Occupied Bandwidth, FCC Part 2, para 2.1049
 Notes: Downlink Frequency 1.9375 GHz
 Modulation: CDMA

Date: 4/20/01 Tech: T. Firkowski Sheet 4 of 6

Retlif Testing Laboratories

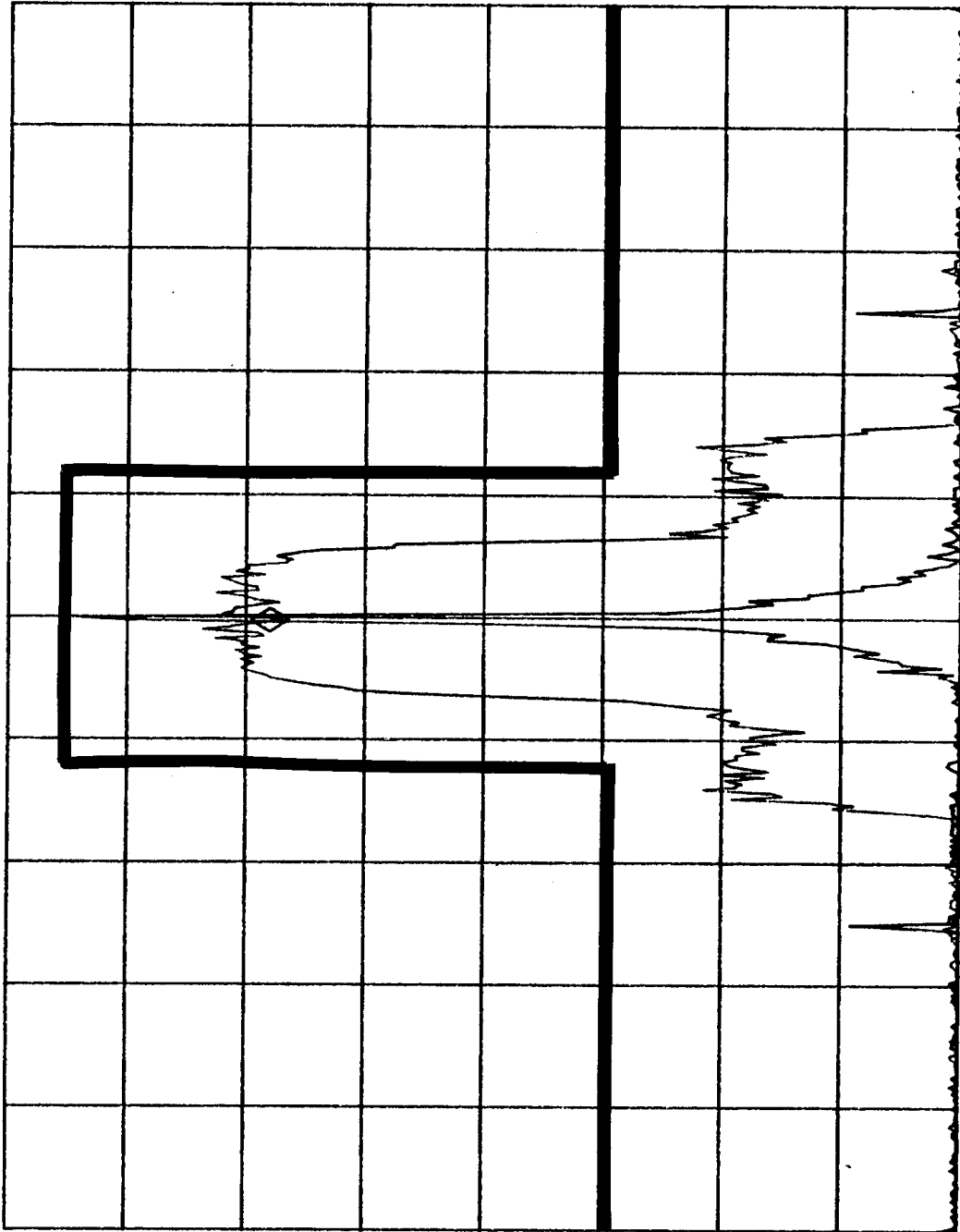
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MKR 1.9374994 GHz
-23.63 dBm

REF . 0 dBm #AT 20 dB

PEAK
LOG
10
dB/



VA VB
SC FC
CORR

CENTER 1.9375000 GHz
#RES BW 300 Hz
SPAN 250.0 kHz
SWP 8.33 sec
VBW 1 kHz

Customer:	Cellular Specialties, Inc.
Test Sample:	Bidirectional Amplifier
Model No:	510PCS
Test Method:	Occupied Bandwidth, FCC Part 2, para 2.1049
Notes:	Downlink Frequency 1.9375 GHz Modulation: TDMA

Date: 4/20/01 Tech: T. Firkowski Sheet 5 of 6

Retlif Testing Laboratories

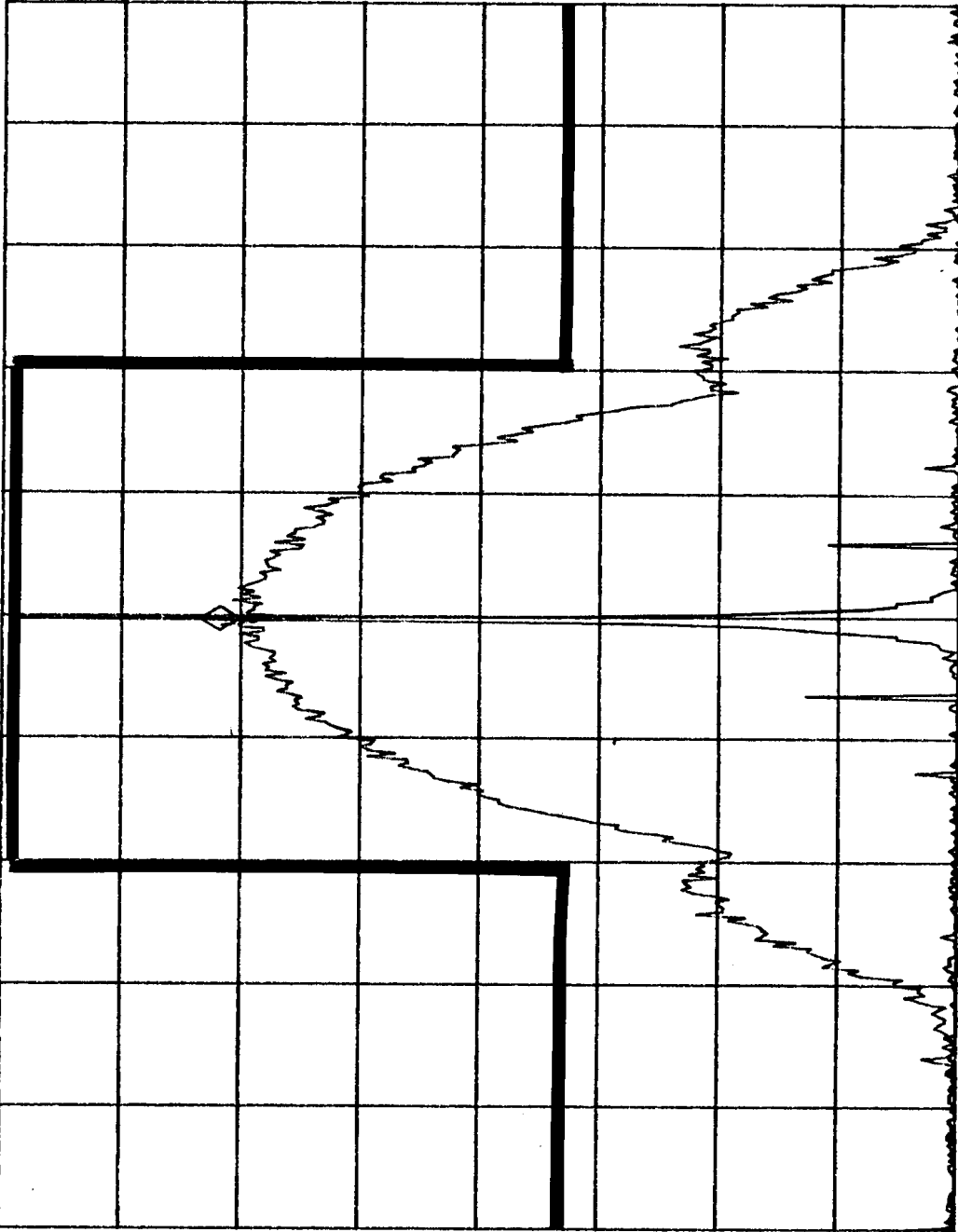
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MKR 1.937498 GHz
-19.87 dBm

#AT 20 dB

REF . 0 dBm



SPAN 1.000 MHz
SWP 33.3 sec

VBW 1 kHz

CENTER 1.937500 GHz
#RES BW 300 Hz

VA VB
SC FC
CORR

Customer:	Cellular Specialties, Inc.
Test Sample:	Bidirectional Amplifier
Model No:	510PCS
Test Method:	Occupied Bandwidth, FCC Part 2, para 2.1049
Notes:	Downlink Frequency 1.9375 GHz Modulation: GSM

Date: 4/20/01 Tech: T. Firkowski Sheet 6 of 6

Retlif Testing Laboratories

Report No. R-3767N

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

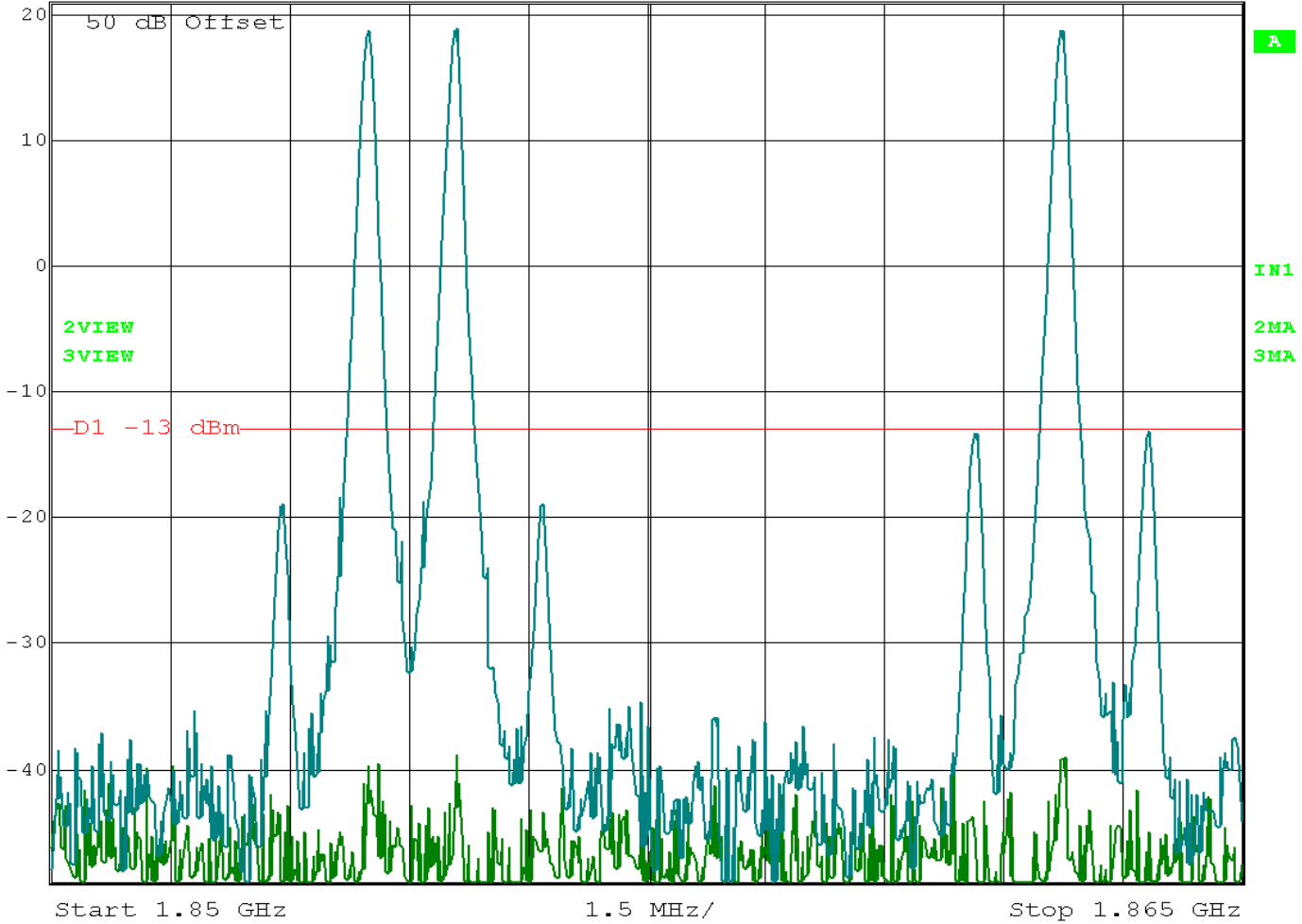
Test Method:	RF Power Output	
Customer:	Cellular Specialties, Inc.	Job No: R-3767N
Test Sample:	Bidirectional Amplifier	
Model No:	510PCS	Serial No: PA5100001
Test Specification:	FCC Part 2	
	Paragraph: 2.1046	
Operating Mode:	Amplifying input signal	
Technician:	T. Firkowski	Date: 4/17/01
Notes:	Uplink Frequency: 1.85 - 1.865 GHz	
	Downlink Frequency: 1.93 - 1.945GHz	

Test Frequency	Power In @ 1dB Compression	Power Output	Gain							
GHz	dBm	dBm	dB							
(Uplink)										
1.8500	-31.36	29.80	61.16							
1.8575	-30.38	31.31	61.69							
1.8650	-27.64	32.43	60.07							
(Downlink)										
1.9300	-30.27	30.98	61.25							
1.9375	-31.25	30.25	61.50							
1.9450	-31.24	29.94	61.18							



Ref Lvl
21 dBm

RBW 100 kHz RF Att 0 dB
 VBW 300 kHz
 SWT 5 ms Unit dBm



Date: 18.MAY.2001 14:41:55

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Intermodulation Characteristics, FCC Part 2, para 2.1047
 Notes: Uplink Frequency Band: 1.85 - 1.865 GHz

Date: 5/18/01 Tech: T. Firkowski Sheet 1 of 4

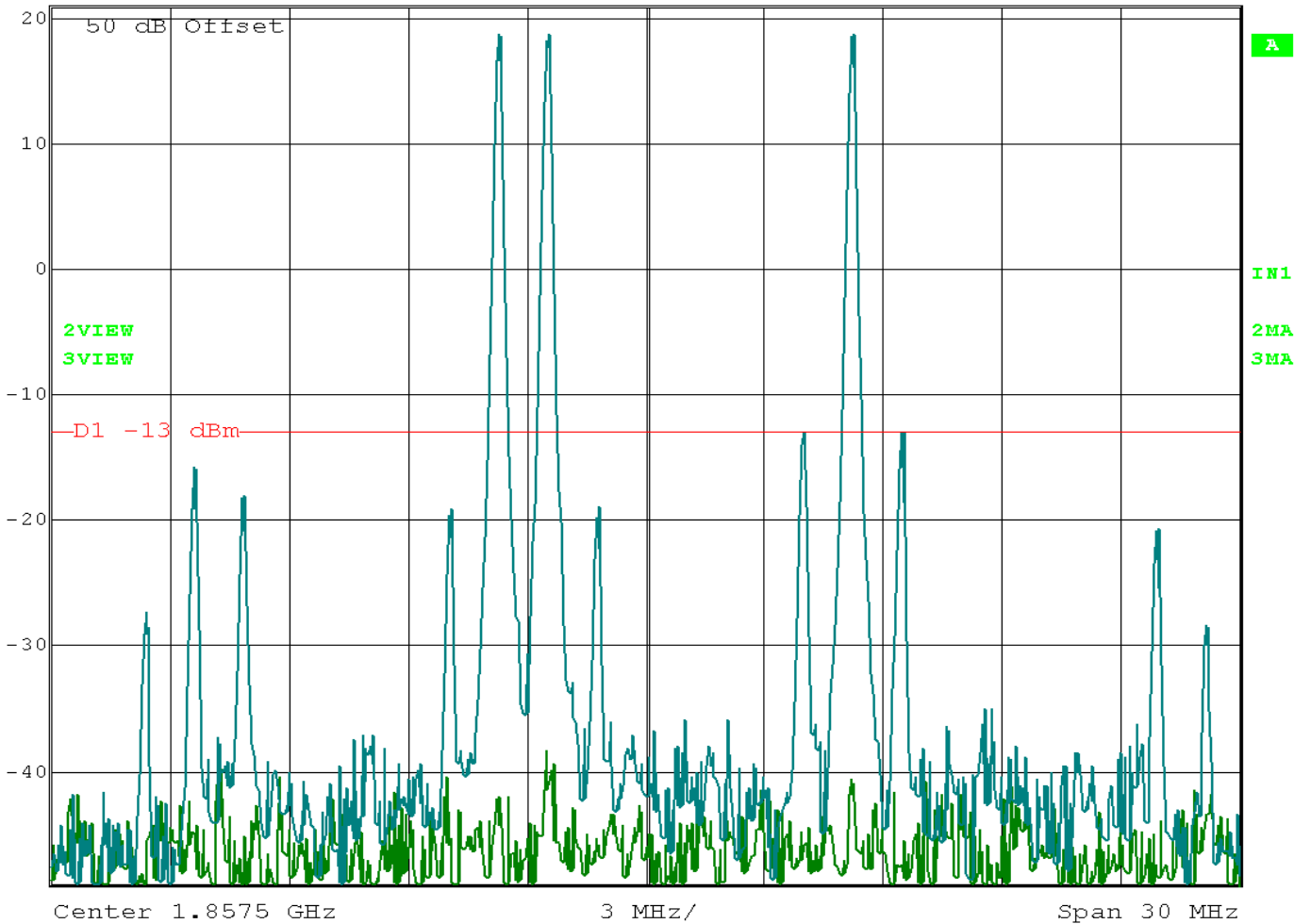
Retlif Testing Laboratories

Report No. R-3767N



Ref Lvl
21 dBm

RBW 100 kHz RF Att 0 dB
 VBW 300 kHz
 SWT 7.5 ms Unit dBm



Date: 18.MAY.2001 15:05:16

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Intermodulation Characteristics, FCC Part 2, para 2.1047
 Notes: Uplink Frequency Band: 1.85 - 1.865 GHz

Date: 5/18/01 Tech: T. Firkowski Sheet 2 of 4

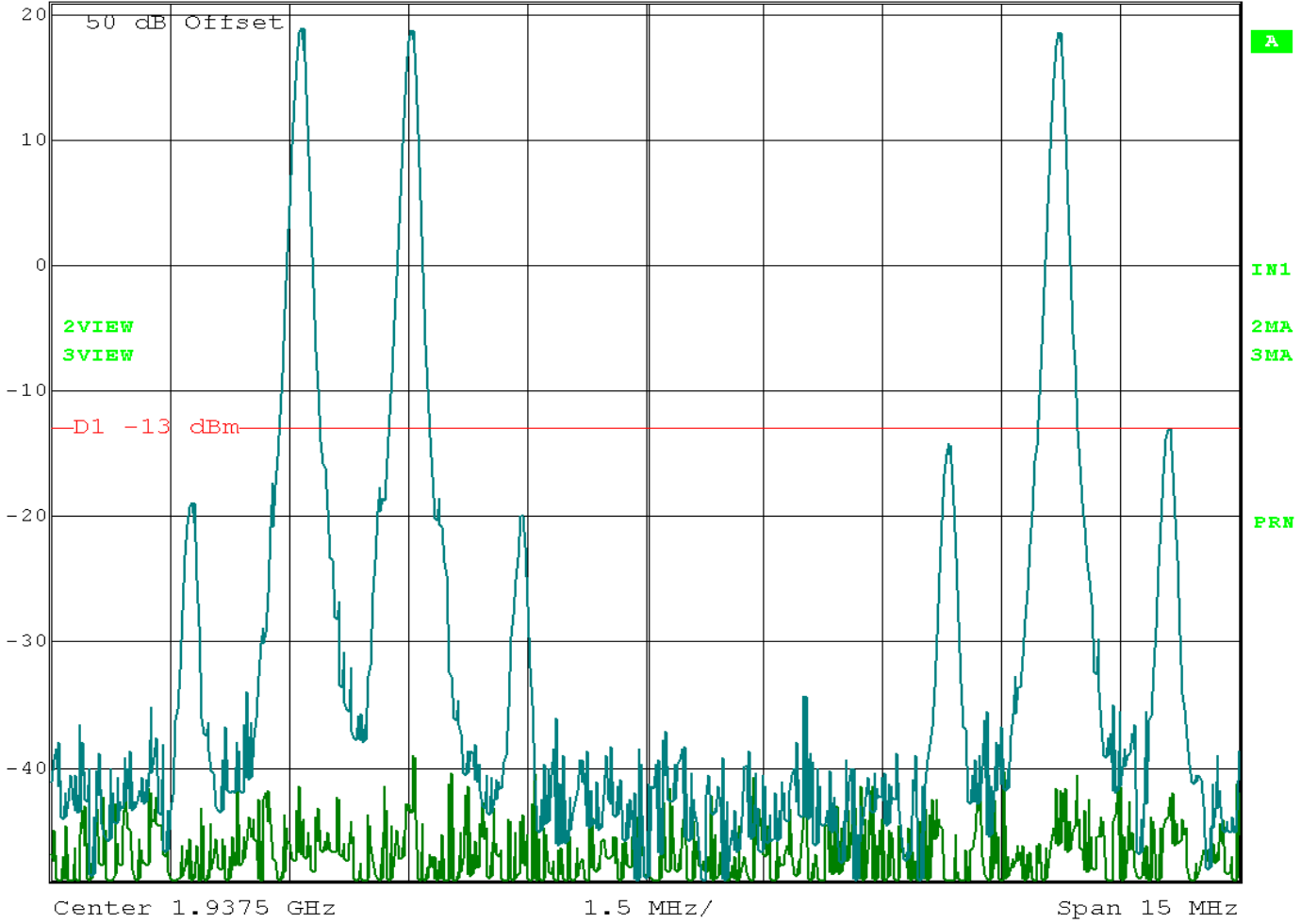
Retlif Testing Laboratories

Report No. R-3767N



Ref Lvl
21 dBm

RBW 100 kHz RF Att 0 dB
 VBW 300 kHz
 SWT 5 ms Unit dBm



Date: 18.MAY.2001 14:49:33

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Intermodulation Characteristics, FCC Part 2, para 2.1047
 Notes: Downlink Frequency Band: 1.93 - 1.945 GHz

Retlif Testing Laboratories

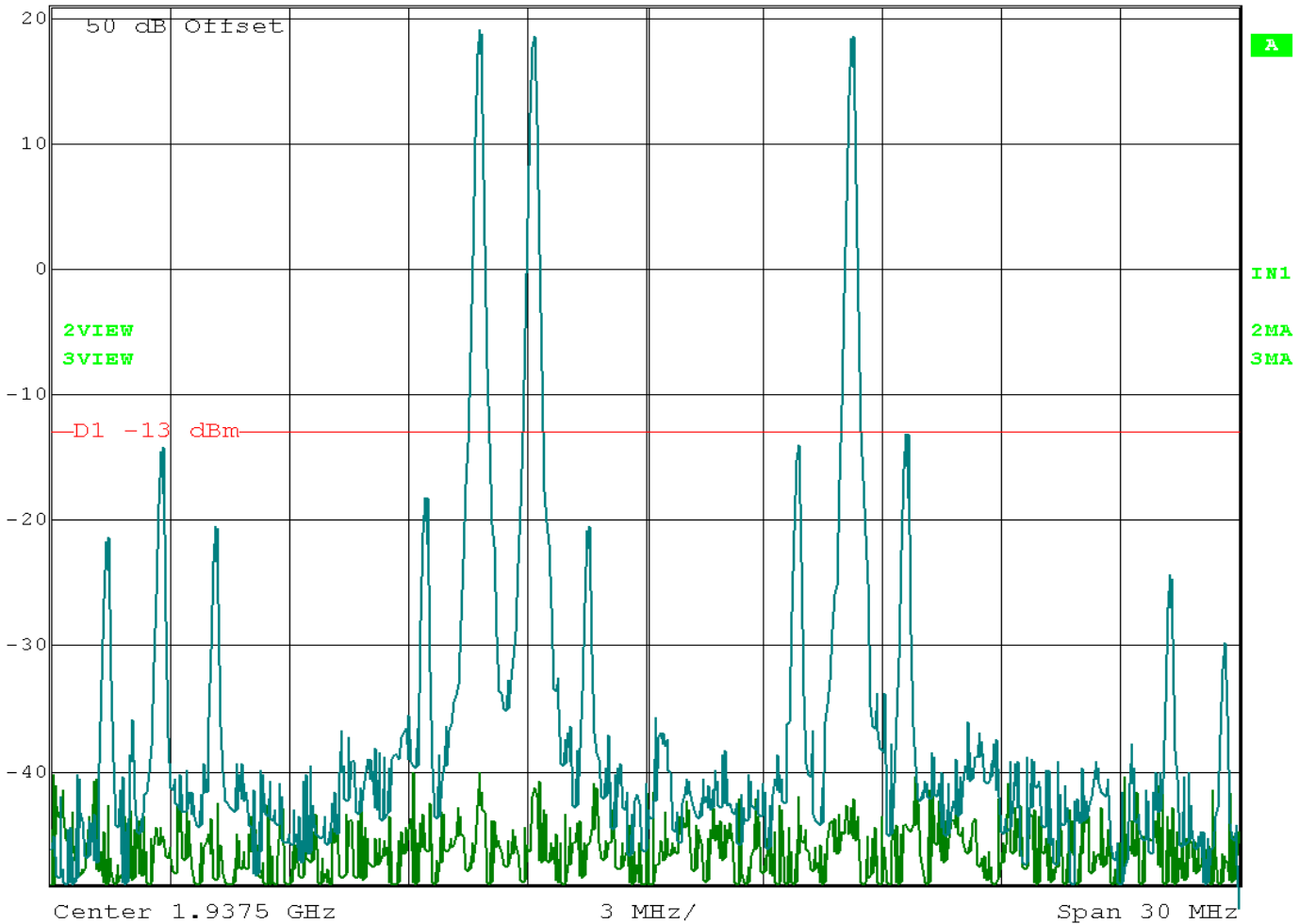
Report No. R-3767N

Date: 5/18/01 Tech: T. Firkowski Sheet 3 of 4



Ref Lvl
21 dBm

RBW 100 kHz RF Att 0 dB
 VBW 300 kHz
 SWT 7.5 ms Unit dBm



Date: 18.MAY.2001 14:58:43

Customer: Cellular Specialties, Inc.
 Test Sample: Bidirectional Amplifier
 Model No: 510PCS
 Test Method: Intermodulation Characteristics, FCC Part 2, para 2.1047
 Notes: Downlink Frequency Band: 1.93 - 1.945 GHz

Date: 5/18/01 Tech: T. Firkowski Sheet 4 of 4

Retlif Testing Laboratories

Report No. R-3767N

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method: Spurious Emissions at the Antenna Terminals 30 MHz to 20 GHz

Customer: Cellular Specialties, Inc. **Job No:** R-3767N

Test Sample: Bidirectional Amplifier

Model No: 510PCS **Serial No:** PA5100001

Test Specification: FCC Part 2
Paragraph: 2.1051

Operating Mode: Amplifying input signal

Technician: T. Firkowski **Date:** 4/18/01

Notes: Uplink Frequency 1.85 - 1.865 GHz
Downlink Frequency 1.93 - 1.945 GHz

Uplink Input Signal	Test Frequency	Harmonic Frequencies	Reading	Limit	Downlink Input Signal	Test Frequency	Harmonic Frequencies	Reading	Limit	
dBm	GHz	GHz	dBm	dBm	dBm	GHz	GHz	dBm	dBm	
-30.38	1.8575	1.8575	31.3		-31.25	1.9375	1.9375	30.3		
		3.7150	<-47.0	-13.0			3.8750	<-47.0	-13.0	
		5.5725	<-47.0				5.8125	<-47.0		
		7.4300	<-39.0				7.7500	<-39.0		
		9.2875	<-39.0				9.6875	<-39.0		
		11.1450	<-39.0				11.6250	<-39.0		
		13.0025	<-37.0				13.5625	<-37.0		
		14.8600	<-37.0				15.5000	<-37.0		
		16.7175	<-36.0				17.4375	<-36.0		
-30.38	1.8575	18.5750	<-36.0	-13.0	-31.25	1.9375	19.3750	<-36.0	-13.0	

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	Frequency Stability		
Customer:	Cellular Specialties, Inc.	Job No:	R-3767N
Test Sample:	Bidirectional Amplifier		
Model No:	510PCS	Serial No:	PA5100001
Test Specification:	FCC Part 2 <div style="text-align: right;">Paragraph: 2.1055</div>		
Operating Mode:	Amplifying input signal		
Technician:	T. Firkowski	Date:	4/18/01
Notes:	Uplink Frequency 1.85 - 1.865 GHz Downlink Frequency 1.93 - 1.945 GHz		

Test Frequency	Input Power	Output Power	Measured Frequency						
GHz	dBm	dBm	GHz						
(Uplink)									
1.8575	-30.38	31.87	1.8575						
	-45.38	21.23	1.8574						
	-60.38	6.34	1.8574						
	-90.38	-23.17	1.8573						
(Downlink)									
1.9375	-31.25	30.25	1.9375						
	-46.25	17.75	1.9374						
	-61.25	2.57	1.9375						
	-91.25	-24.88	1.9374						