



**FCC Compliance Report
Part 22 Certification
For
GTE Railfone, LLC
Intelligent Booster Amplifier**

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**FCC Compliance Report
Part 22 Certification
For
GTE Railfone, LLC
Intelligent Booster Amplifier**

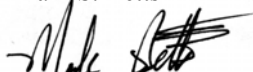
Date : 7/18/03
MJO # : 40371-04
File : 40371-04-1rev4.VCE
Revision # : 3
Product : Intelligent Booster Amplifier
Manufacturer : GTE Railfone, LLC
P.O. # : C000420

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This report shall not be reproduced, except in full, without the written approval of NTS, Inc.
The test results relate only to the items tested.

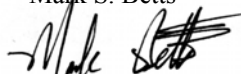


Product : Intelligent Booster Amplifier
Model : 51502
Serial Number : See Equipment List
Manufacturer : GTE Railfone, LLC
Address : 1515 Woodfield Road
Schaumburg, IL 60173
USA
Phone : 847 619 4145
Fax : 847 706 2493
Date Received : 6/6/03
Contact : John Pawlik
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Prepared By : Mark S. Betts Date: 7/18/03


(Senior EMC Test Engineer)

Reviewed By : Mark S. Betts Date: 7/18/03


(Program Manager)

Approved By : Richard C. Gaynor Date: 7/18/03


(Facility Manager)



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1. General Description:

The Intelligent Booster Amplifier (IBA) is intended to improve cellular telephone coverage in weak signal areas. The IBA communicates with standard cell site transmitter/receiver network via an external antenna that is positioned within the coverage area of the standard system (primary antenna). Via radiating cable or other local antenna (secondary antenna), the IBA then amplifies and repeats these communications to mobile cellular handsets within the thusly-expanded coverage area.

2. Classification and Environment:

FCC Part 22, Public Mobile Services and TIA/EIA 603 Land Mobile FM or PM Communications Equipment Measurement and Performance standards are applied to the Intelligent Booster Amplifier.

3. Test Summary:

Tests
Transmitter Power Conducted Output
Transmitter Occupied Bandwidth
Input/Output Power Ratio
Conducted Spurious Emissions
Radiated Spurious Emissions
Band Edge Measurements

4. Test Report Summary:

The Intelligent Booster Amplifier was tested to the specified standards.

4.1. Test Sample Description:

The Intelligent Booster amplifier consists of nine major subsystems. Each subsystem is assembled in standard 19" rack panels.

**4.1.1. Block Diagram:**

Not available

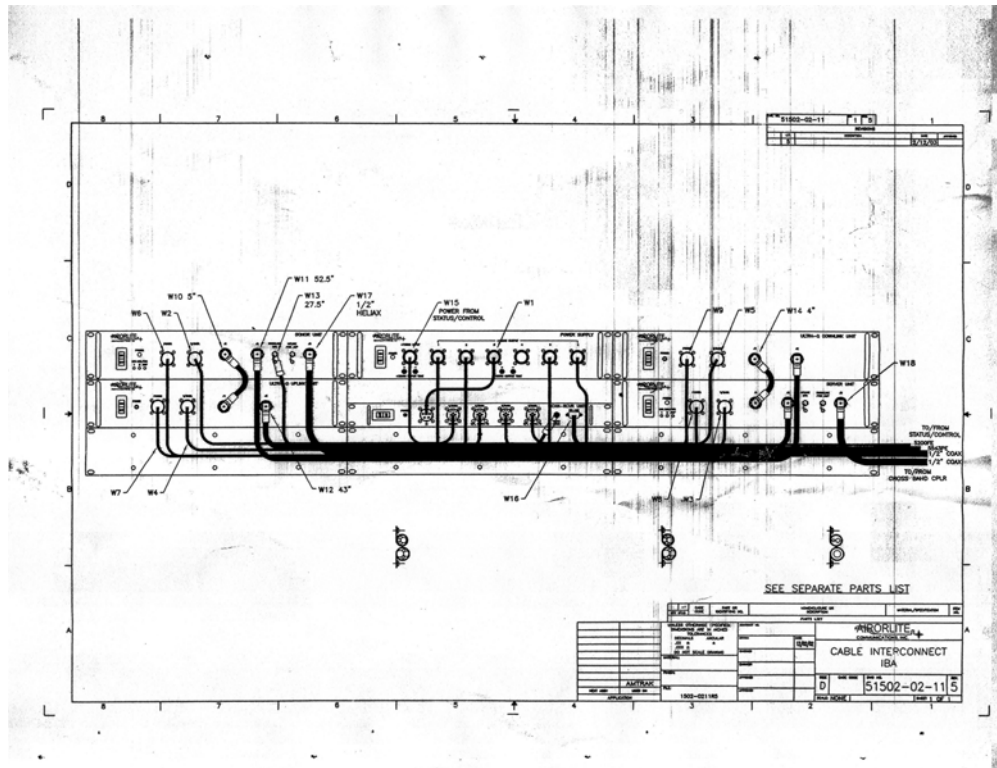
4.1.2. EUT Equipment List:

The table below displays what the EUT consists of during the tests.

Manufacturer	Make	Model	Serial Number
GTE Railfone, LLC	Status & Control Panel	51502-StatCtrl	1202-03
GTE Railfone, LLC	Ultra-Q Downlink Unit	51502-DLUQ	1202-02
GTE Railfone, LLC	Server Unit	51502-Server	1202-03
GTE Railfone, LLC	Power Supply	51502-PwrSupply	1202-03
GTE Railfone, LLC	Scan Receiver	51502-ScanRx	1202-03
GTE Railfone, LLC	Donor Unit	51502-Donor	1202-03
GTE Railfone, LLC	Ultra-Q Uplink Unit	51502-ULUQ	1202-02
Sony	Vaio Notebook Computer	PCG-Z505HS	28305530 3108025

4.1.3. EUT Cabling:

The diagram below displays the cable configuration of the EUT and accessories.



4.2. Test Configuration:

4.2.1. EUT Electrical Mode of Operation:

The EUT was operated at 72 VDC Nominal.
The EUT was run in Key On mode.

4.2.2. Software/Firmware:

IBA Exerciser Software

4.3. Test Procedure:

The EUT's testing was performed in accordance with approved test procedures specified in the applicable standards. All test procedures can be found with their appropriate tests.



4.4. Test Results and Data:

4.4.1. Transmitter Conducted Power Output:

Transmitter Conducted Power Output testing was conducted as defined in TIA\EIA-603, Paragraph 2.2.1

A spectrum analyzer was used to perform this test. The test was done on both uplink and downlink sides of the unit. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to the input of the spectrum analyzer through a 30 dB attenuator. All measurements include attenuator and cable losses.



Transmitter Conducted Power Output Report

MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	6/11/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Safety Area
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC



Transmitter Conducted Power Output Test Results
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Conducted Power Output (dBm)	Conducted Power Output (W)	Input (dBm)
Downlink			
A			
869	19.81	.0957	-43
875	24.44	.277	-43
880	24.03	.253	-43
890	17.16	.0519	-43
890.75	23.41	.219	-43
891.5	21.25	.133	-43
B			
880	17.34	.0542	-43
885	24.16	.260	-43
890	20.91	.123	-43
891.5	16.22	.041	-43
892.75	24.31	.269	-43
894	19.06	.0805	-43



Transmitter Conducted Power Output Test Results
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Conducted Power Output (dBm)	Conducted Power Output (W)	Input (dBm)
Uplink			
A			
824	27.91	.618	-26
830	27.78	.600	-26
835	28.54	.714	-26
845	28.60	.724	-26
845.75	27.69	.587	-26
846.5	28.72	.745	-26
B			
835	28.82	.762	-26
840	28.09	.645	-26
845	28.72	.746	-26
846.5	28.82	.762	-26
847.75	27.72	.591	-26
849	28.66	.735	-26



Transmitter Conducted Power Output Equipment List:

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



4.4.2. Transmitter Occupied Bandwidth:

Transmitter Occupied Bandwidth testing was conducted as defined in TIA/EIA-603, Paragraph 2.2.11

A spectrum analyzer was used to perform this test. The test was done on both uplink and downlink sides of the unit. CDMA modulation was used. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to the input of the spectrum analyzer through a 30 dB attenuator. All measurements include attenuator and cable losses.

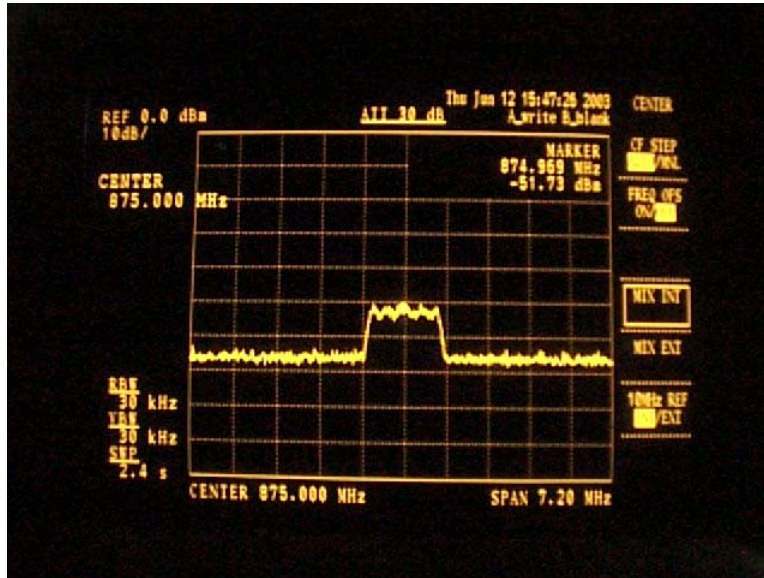


Transmitter Occupied Bandwidth Laboratory Report

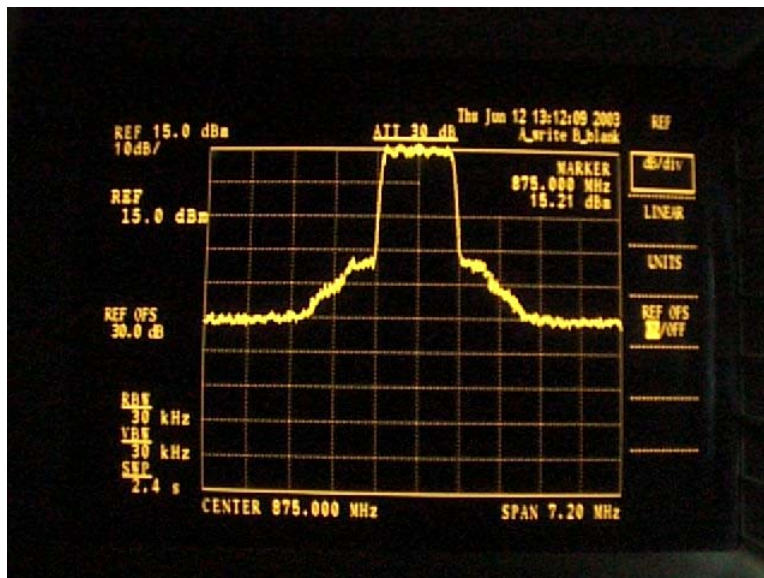
MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	6/10/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Safety Area
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC

Transmitter Occupied Bandwidth Test Results:
Note: All levels include attenuator and cable losses.

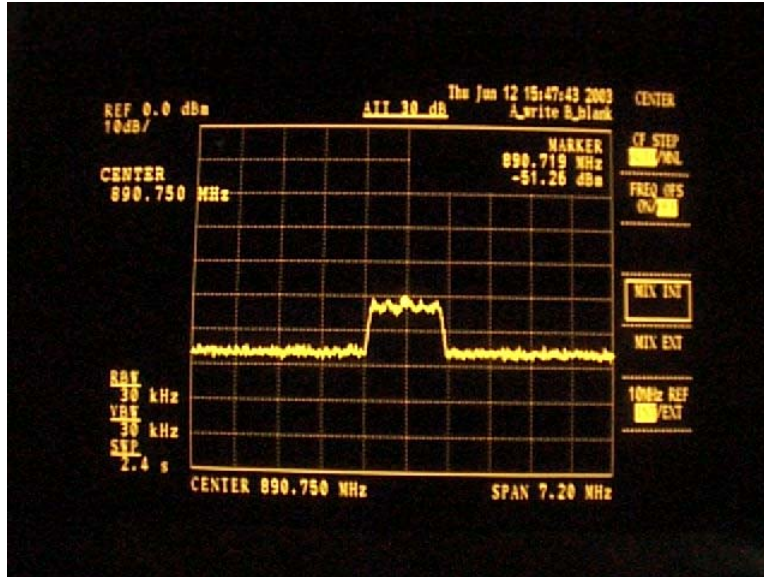
Input @ 875 MHz-Downlink



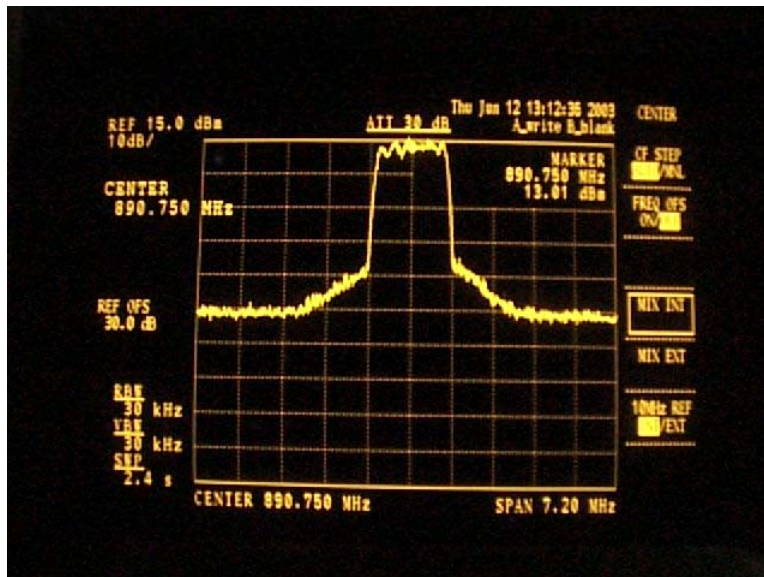
Output @ 875 MHz-Downlink



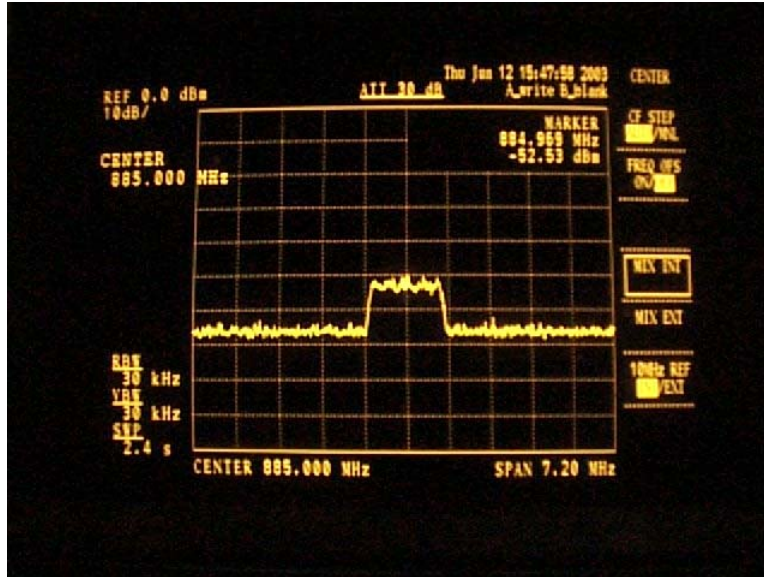
Input @ 890.75 MHz -Downlink



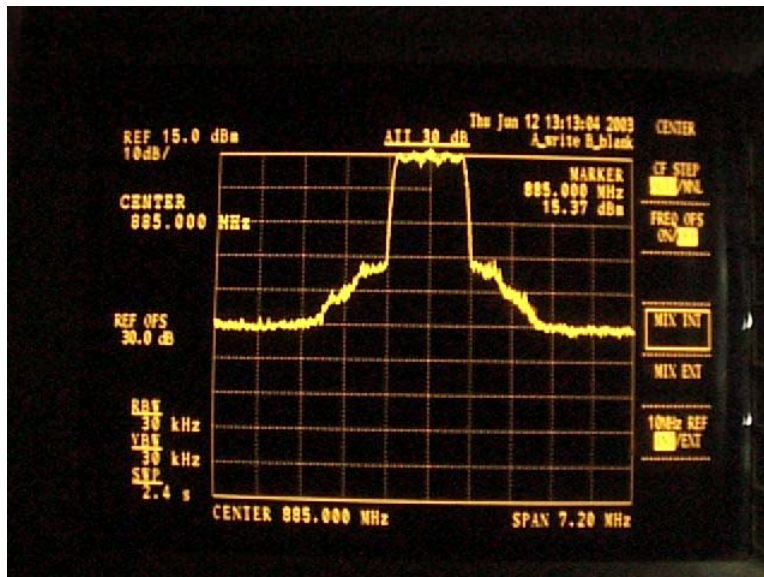
Output @ 890.75 MHz-Downlink



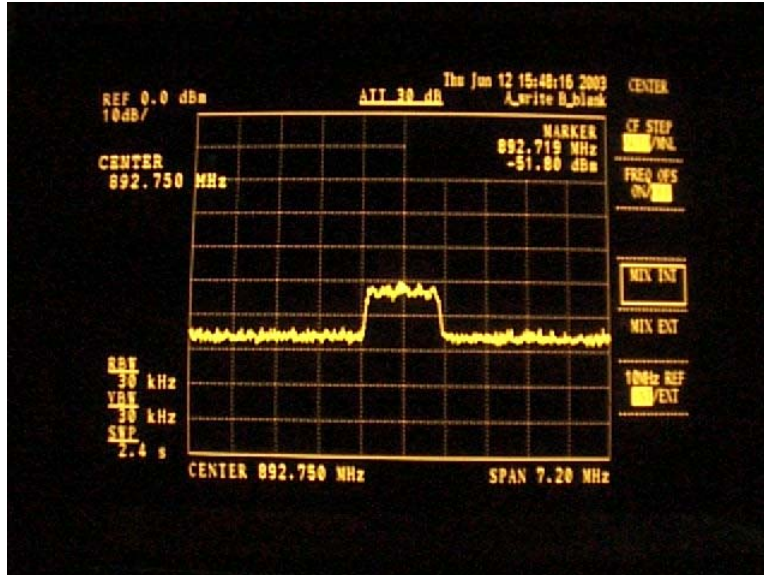
Input @ 885 MHz-Downlink



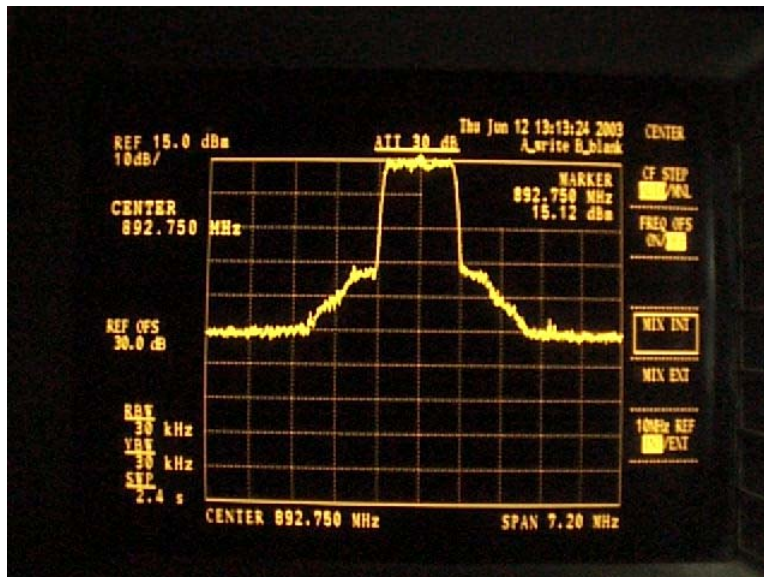
Output @ 885 MHz-Downlink



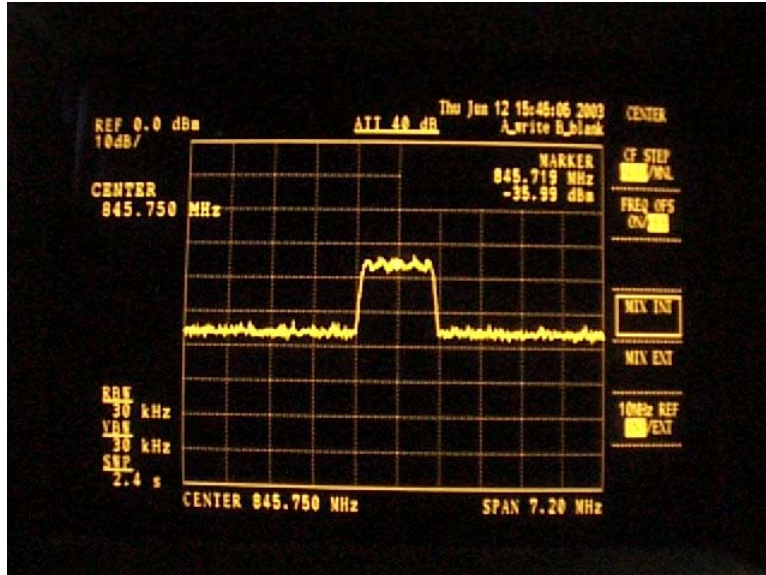
Input @ 892.75 MHz-Downlink



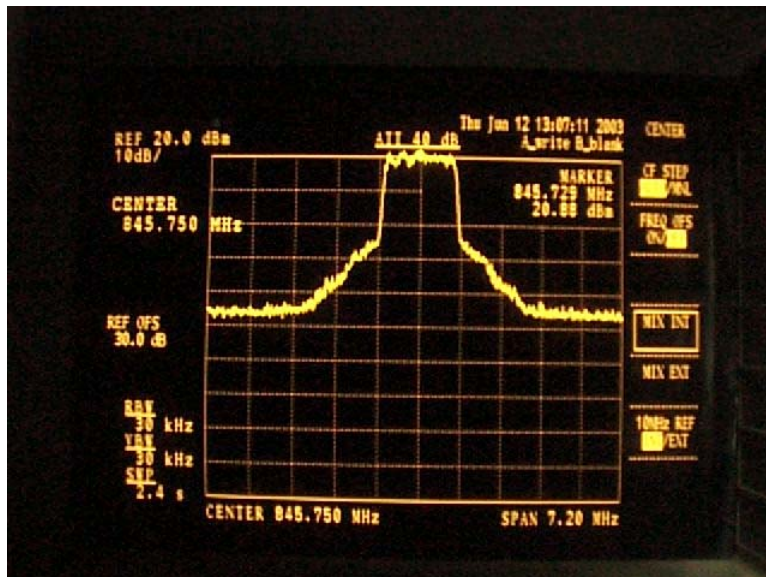
Output @ 892.75 MHz-Downlink



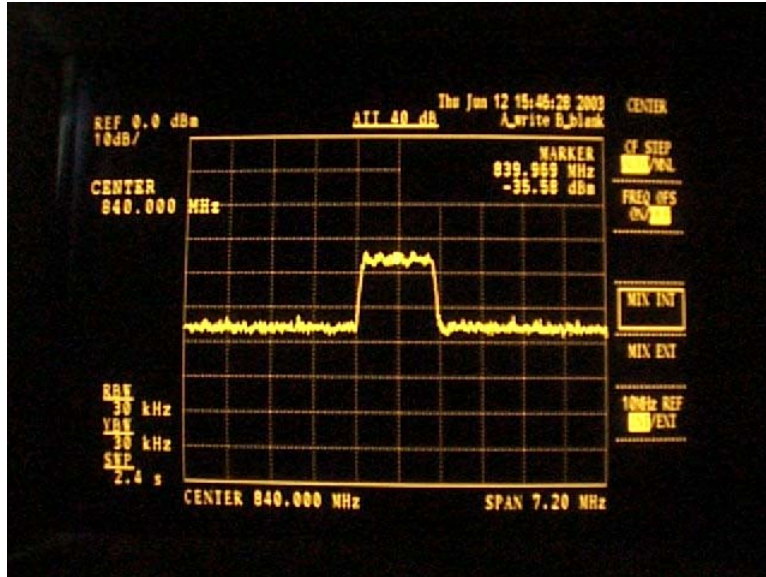
Input @ 845.75 MHz-Uplink



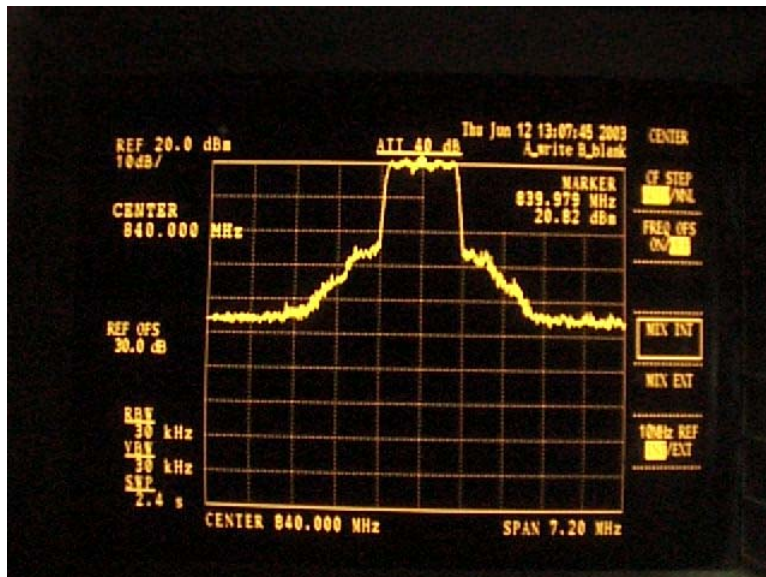
Output @ 845.75 MHz-Uplink



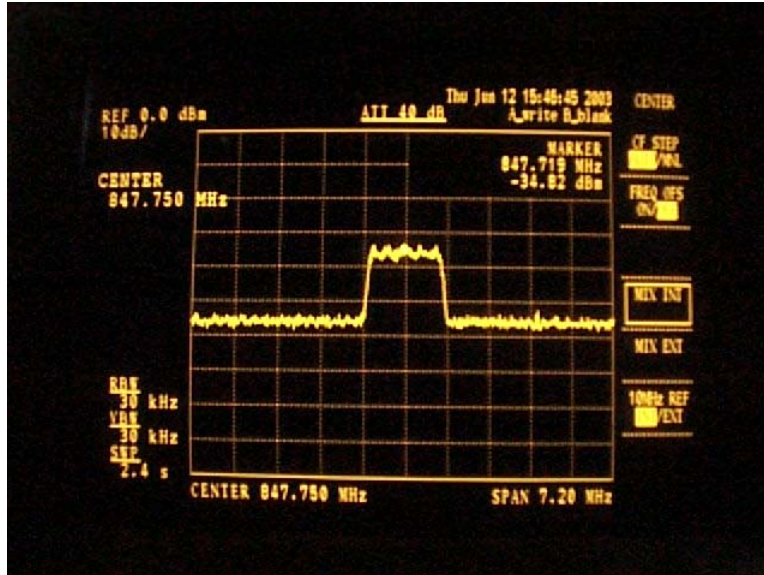
Input @ 840 MHz-Uplink



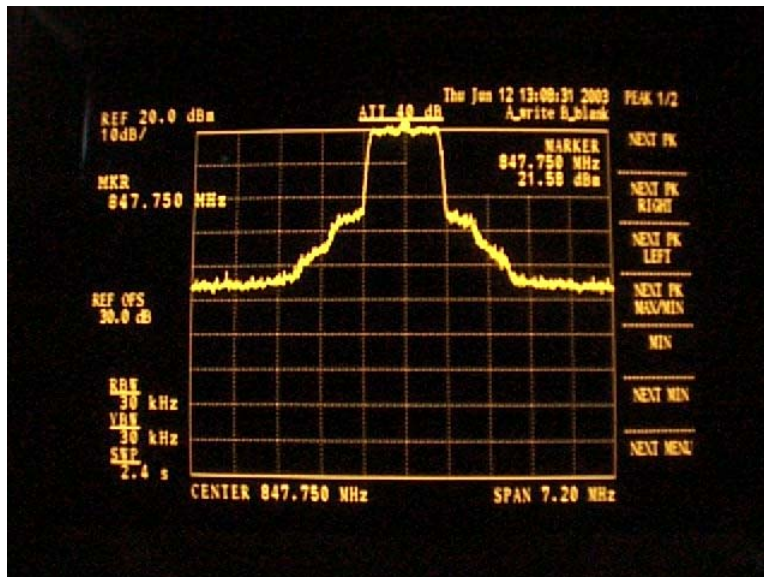
Output @ 840 MHz-Uplink



Input @ 847.75 MHz-Uplink



Output @ 847.75 MHz-Uplink





Transmitter Occupied Bandwidth Equipment List:

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



4.4.3. Input vs. Output Power

Input vs. Output Power testing was conducted with a spectrum analyzer. The test was done on both uplink and downlink sides of the unit. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to the input of the spectrum analyzer through a 30 dB attenuator. All measurements include attenuator and cable losses.

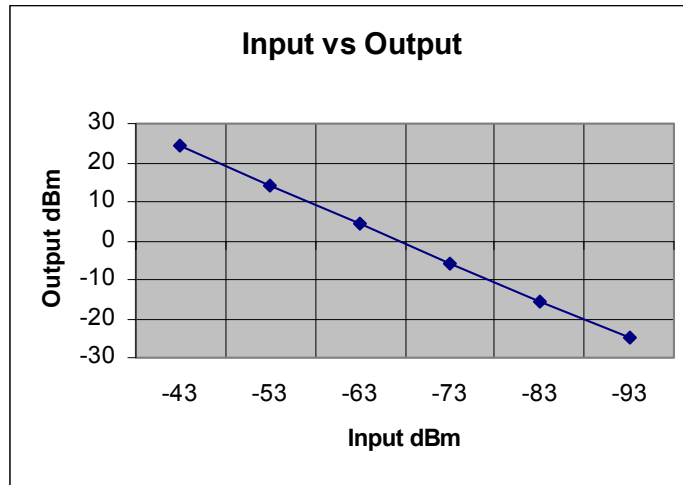


Input vs. Output Power Laboratory Report

MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	3/9/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Safety Area
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC

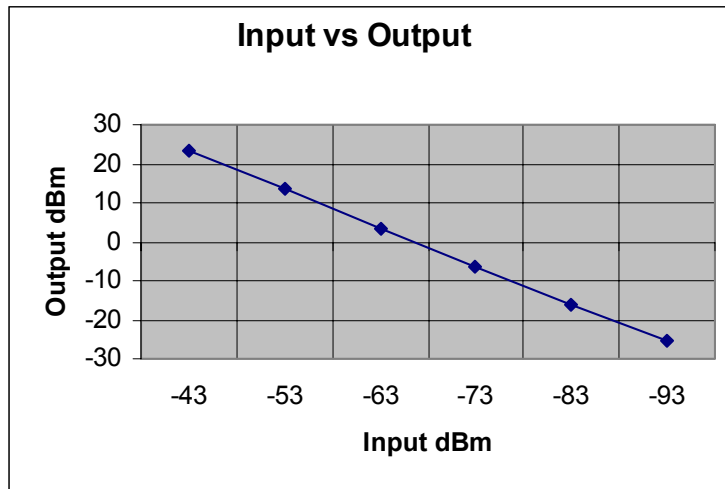
Input vs. Output Power Test Results-Downlink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
885	-43	24.48
885	-53	14.34
885	-63	4.23
885	-73	-5.66
885	-83	-15.55
885	-93	-25.09



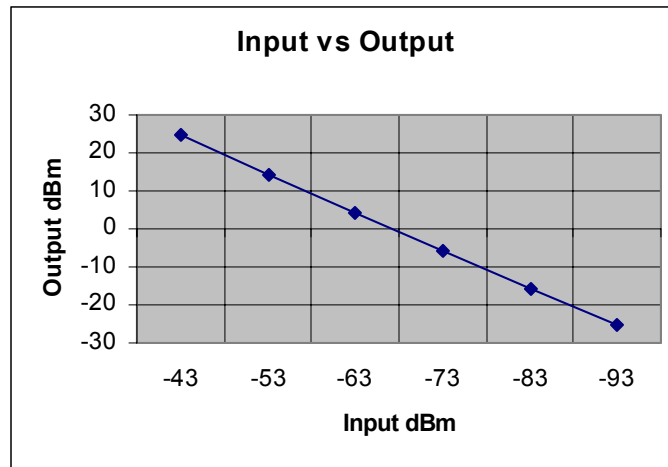
Input vs. Output Power Test Results-Downlink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
892.75	-43	23.52
892.75	-53	13.52
892.75	-63	3.52
892.75	-73	-6.48
892.75	-83	-16.22
892.75	-93	-25.61



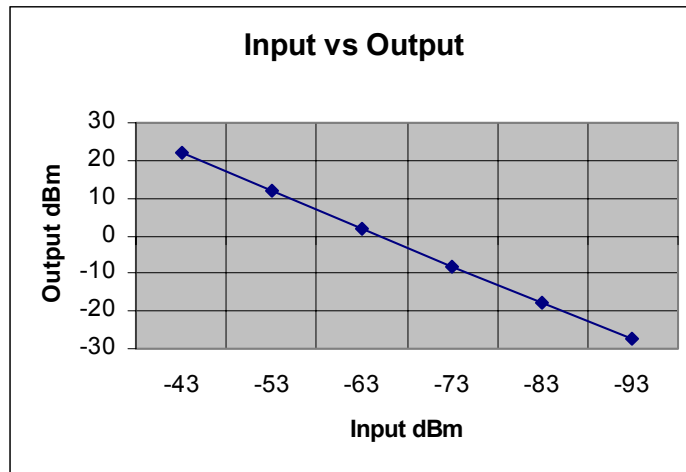
Input vs. Output Power Test Results-Downlink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
875	-43	24.48
875	-53	14.34
875	-63	4.23
875	-73	-5.66
875	-83	-15.55
875	-93	-25.09



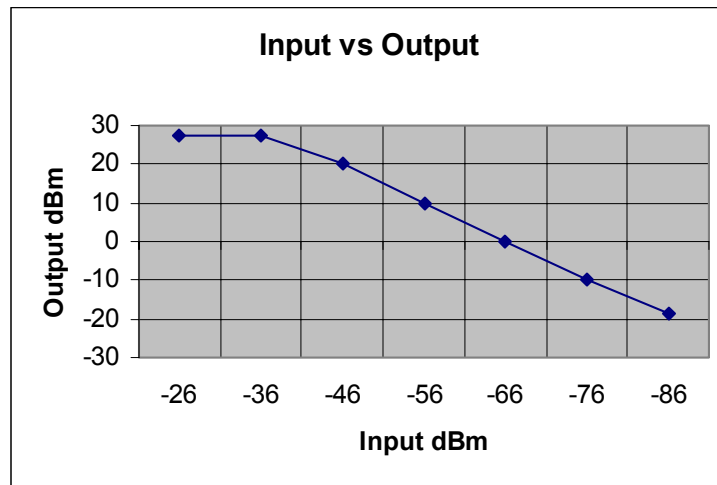
Input vs. Output Power Test Results-Downlink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
890.75	-43	21.98
890.75	-53	11.92
890.75	-63	1.78
890.75	-73	-8.05
890.75	-83	-17.7
890.75	-93	-27.24



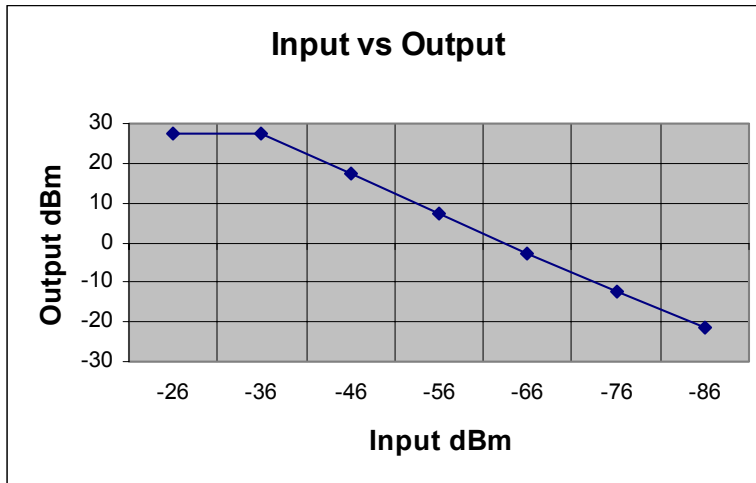
Input vs. Output Power Test Results-Uplink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
840	-26	27.61
840	-36	27.52
840	-46	20.05
840	-56	10.04
840	-66	0.04
840	-76	-9.69
840	-86	-18.81



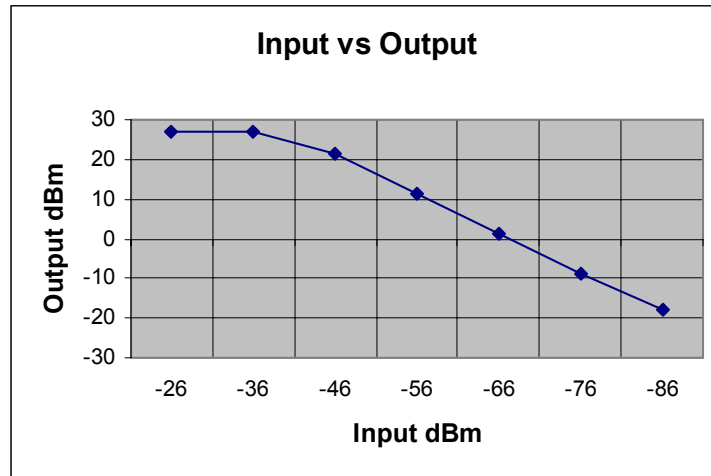
Input vs. Output Power Test Results-Uplink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
847.75	-26	27.45
847.75	-36	27.26
847.75	-46	17.23
847.75	-56	7.13
847.75	-66	-2.78
847.75	-76	-12.4
847.75	-86	-21.31



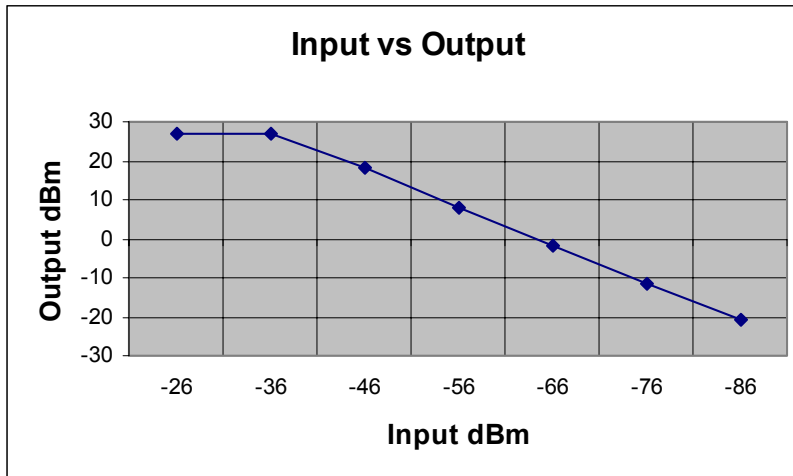
Input vs. Output Power Test Results-Uplink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
830	-26	26.95
830	-36	26.9
830	-46	21.23
830	-56	11.22
830	-66	1.13
830	-76	-8.8
830	-86	-17.95



Input vs. Output Power Test Results-Uplink:
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Input (dBm)	Total Output (dBm)
845.75	-26	27.13
845.75	-36	27.04
845.75	-46	17.95
845.75	-56	7.92
845.75	-66	-2.01
845.75	-76	-11.66
845.75	-86	-20.71





Input vs. Output Power Equipment List:

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



4.4.4. Transmitter Conducted Spurs:

Transmitter Conducted Spurs testing was conducted as defined in TIA/EIA-603, Paragraph 2.2.13.

A spectrum analyzer was used to perform this test. The test was done on both uplink and downlink sides of the unit. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to the input of the spectrum analyzer through a 30 dB attenuator. All measurements include attenuator and cable losses.

Conducted Spurs were checked to the 10th harmonic. No signals were found after the 4th harmonic.



Transmitter Conducted Spurs Report

MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	7/8/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Safety Area
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC



Transmitter Conducted Spurs Test Results
Note: All levels include attenuator and cable losses.

Frequency (MHz)	Level (dBm)	Limit (dBm)	Delta (dBm)
Downlink			
894 Fundamental	19.44	N/A	N/A
1788	-44.18	-13.0	-31.18
2682	-56.41	-13.0	-43.41
887 Fundamental	23.74	-13.0	N/A
1774	-36.16	-13.0	-23.16
2661	-44.69	-13.0	-31.69
3548	-55.19	-13.0	-42.19
880 Fundamental	16.12	N/A	N/A
1760	-45.92	-13.0	-32.92
891.5 Fundamental	20.42	N/A	N/A
1783	-40.04	-13.0	-27.4
2674	-51.78	-13.0	-38.78
880.25 Fundamental	22.71	N/A	N/A
1760	-34.42	-13.0	-21.42
2640	-42.47	-13.0	-29.47
869 Fundamental	17.79	N/A	N/A
1738	-41.74	-13.0	-28.74
2607	-54.25	-13.0	-41.25
Uplink			
849 Fundamental	27.27	N/A	N/A
1698	-29.51	-13.0	-16.51
2547	-35.37	-13.0	-22.37
3396	-51.44	-13.0	-38.44



Frequency (MHz)	Level (dBm)	Limit (dBm)	Delta (dBm)
842 Fundamental	29.4	N/A	N/A
1684	-27.48	-13.0	-14.48
2526	-33.02	-13.0	-20.02
3368	-56.34	-13.0	-43.34
835 Fundamental	28.87	N/A	N/A
1670	-26.26	-13.0	-13.26
2505	-36.46	-13.0	-23.46
3340	-45.86	-13.0	-32.86
846.5 Fundamental	28.91	N/A	N/A
1693	-28.14	-13.0	-15.14
2539	-34.22	-13.0	-21.22
3386	-53.24	-13.0	-40.24
835.25 Fundamental	29.43	N/A	N/A
1670	-26.23	-13.0	-13.23
2505	-30.45	-13.0	-17.45
3341	-46.02	-13.0	-33.02
824 Fundamental	28.43	N/A	N/A
1648	-26.00	-13.0	-13.00
2472	-30.48	-13.0	-17.48
3296	-31.24	-13.0	-18.24



Transmitter Conducted Spurs Equipment List:

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



4.4.5. Transmitter Radiated Spurs:

Transmitter Radiated Spurs testing was conducted as defined in TIA/EIA-603, Paragraph 2.2.12.

A spectrum analyzer connected to an antenna was used to perform this test. The test was done on both uplink and downlink sides of the unit. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to a cable terminated by a 50-ohm load. All measurements include antenna factors and cable losses. Radiated Spurs were checked to the 10th harmonic. No spurious emissions were detected.



Transmitter Radiated Spurs Report

MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	6/13/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Semi-Anechoic Chamber
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC



Transmitter Radiated Spurs Test Results

No Radiated Spurious Emissions were detected. Any emissions would be below the noise floor, which was at -20 dBm.

**Transmitter Radiated Spurs Equipment List:**

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
AN371	Emco	Active Rod Antenna	3301B	9607-3708	07/15/02	07/15/05
AN368	Emco	Biconilog Antenna	3143	9607-1282	07/01/02	07/01/05
AN354	Electrometrics	Double Ridged Guide Antenna	6150	6150	05/17/01	05/17/04
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



4.4.6. Transmitter Band Edge:

Transmitter Band Edge testing was conducted as defined in TIA/EIA-603, Paragraph 2.2.11

A spectrum analyzer was used to perform this test. The test was done on both uplink and downlink sides of the unit. CDMA modulation was used. The output of a signal generator was connected to the input of the unit. The output of the unit was connected to the input of the spectrum analyzer through a 30 dB attenuator. All measurements include attenuator and cable losses.

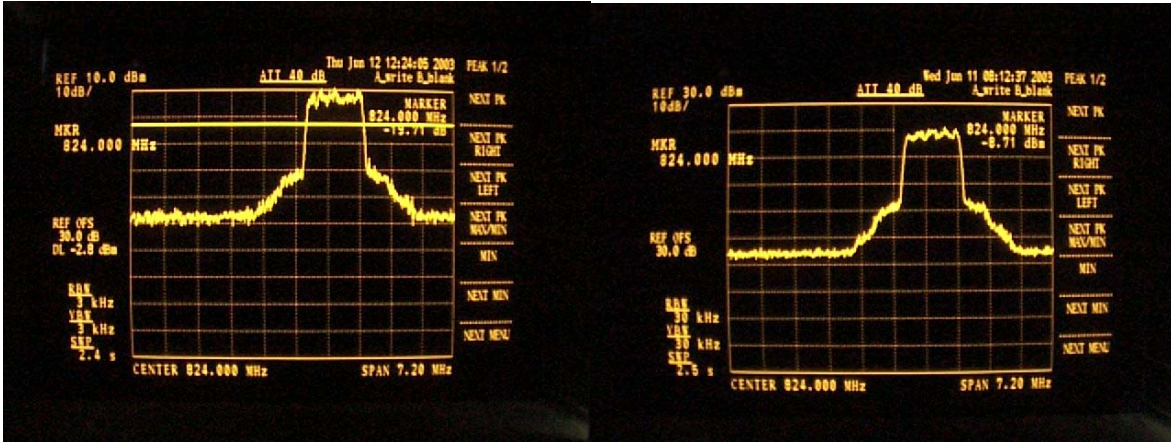


Transmitter Band Edge Laboratory Report

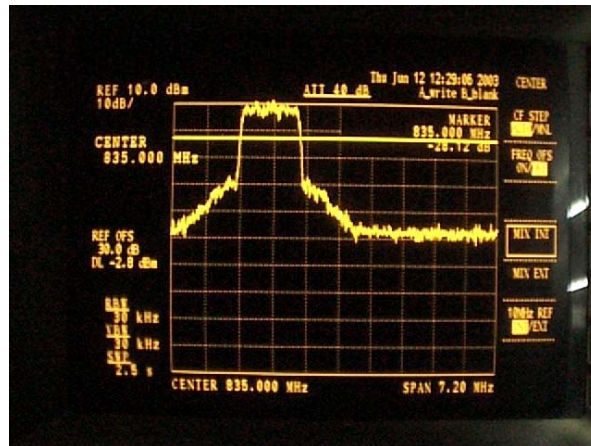
MJO #:	40371-04	Applied Standard:	TIA/EIA 603
Manufacturer Name:	GTE Railfone, LLC	Date of Test:	3/12/03
Product Name:	Intelligent Booster Amplifier	Tester:	Mark Betts
Model Number:	51502	Test Facility:	Safety Area
Serial Number:	See Equipment List	Temperature:	20°C
Performance Criteria:	N/A	Relative Humidity:	48%
EUT Mode:	Key On	EUT Power:	72 VDC

Transmitter Band Edge Test Results:
Note: All levels include attenuator and cable losses.

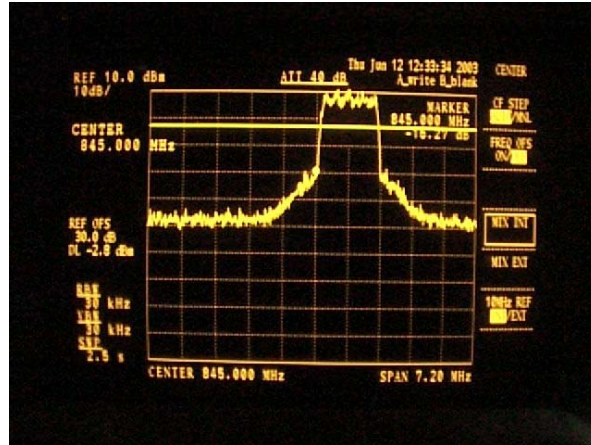
824 MHz-Uplink-Lower Band Edge



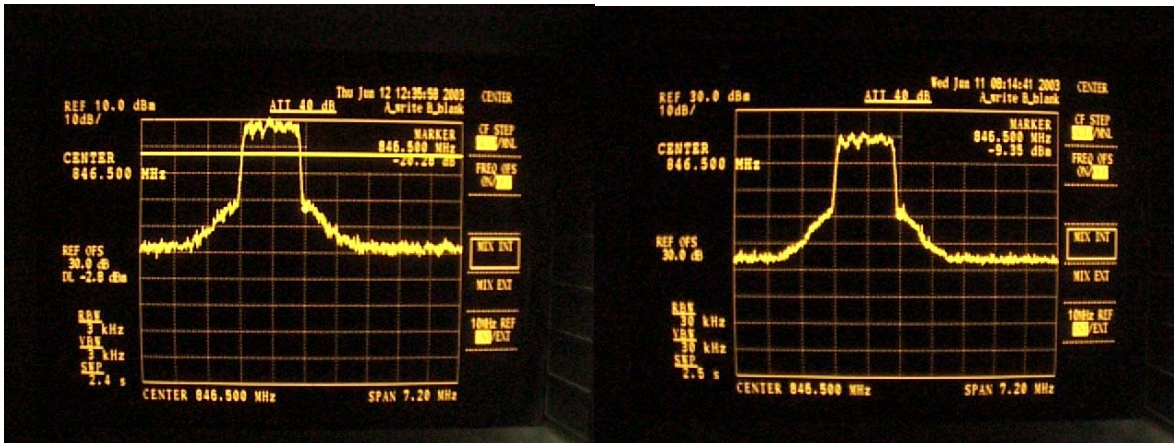
835 MHz-Uplink-Upper Band Edge



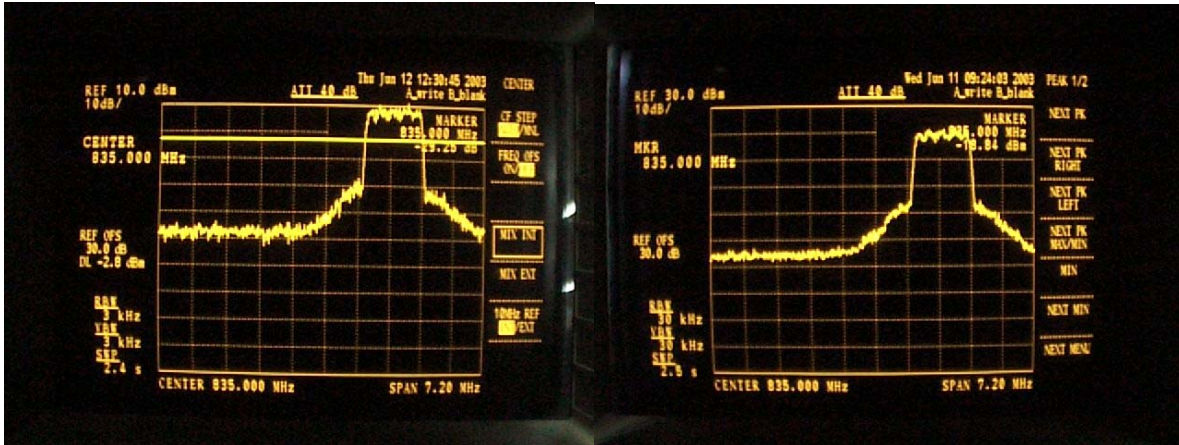
845 MHz—Uplink-Lower Band Edge



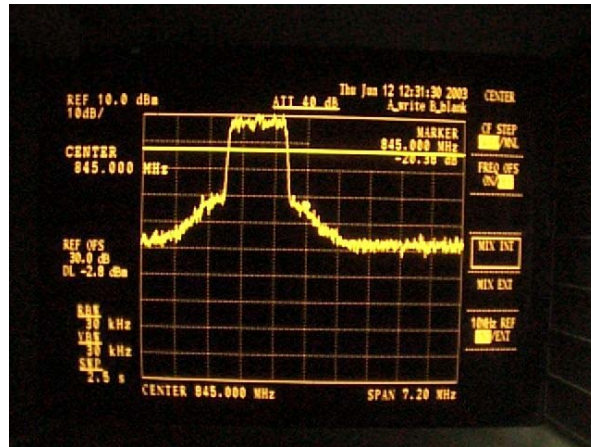
846.5 MHz-Uplink-Upper Band Edge



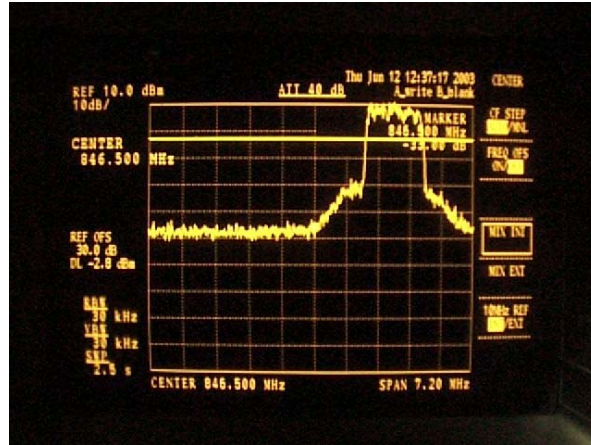
835 MHz-Uplink-Lower Band Edge



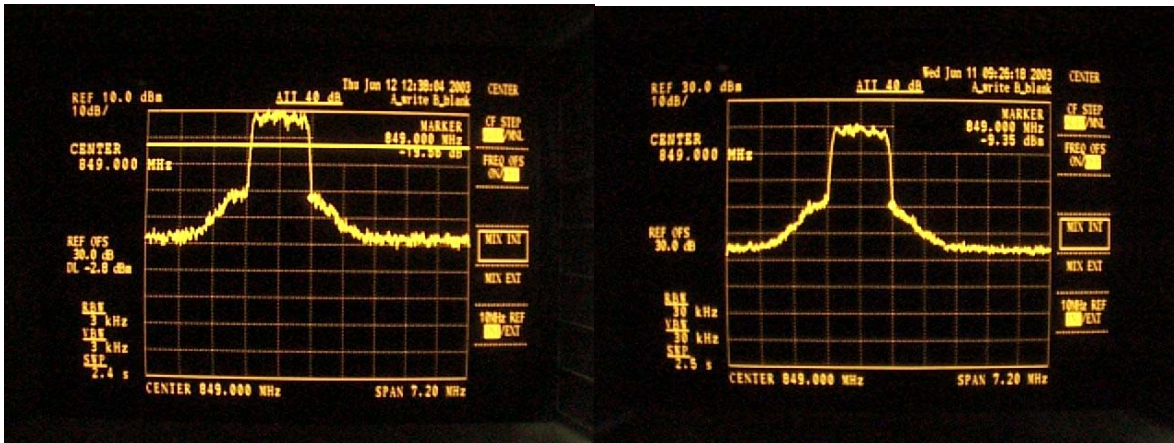
845 MHz-Uplink-Upper Band Edge



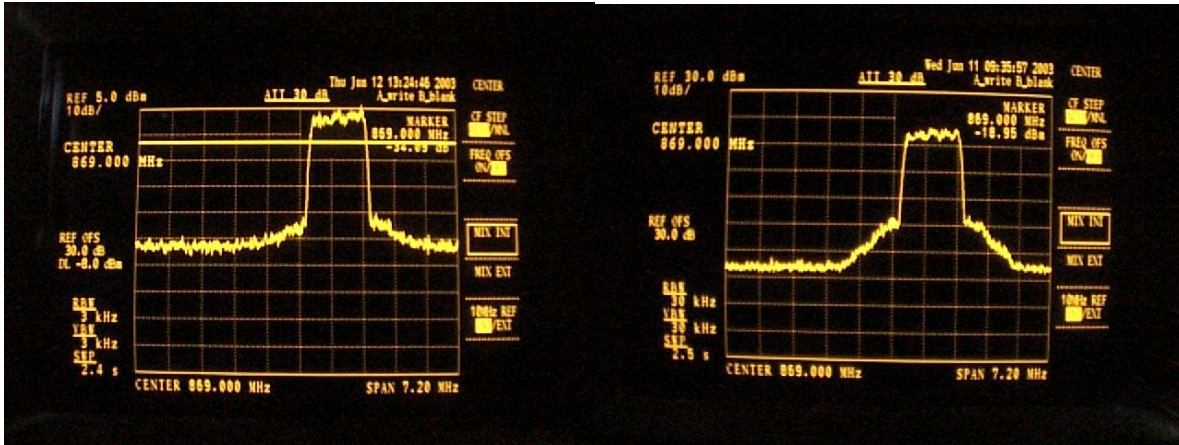
846.5 MHz-Uplink-Lower Band Edge



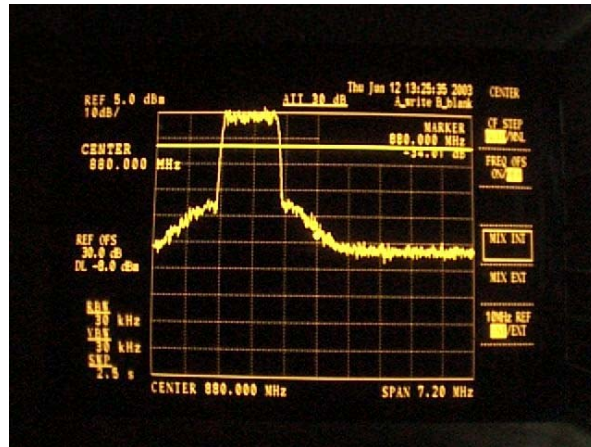
849 MHz-Uplink-Upper Band Edge



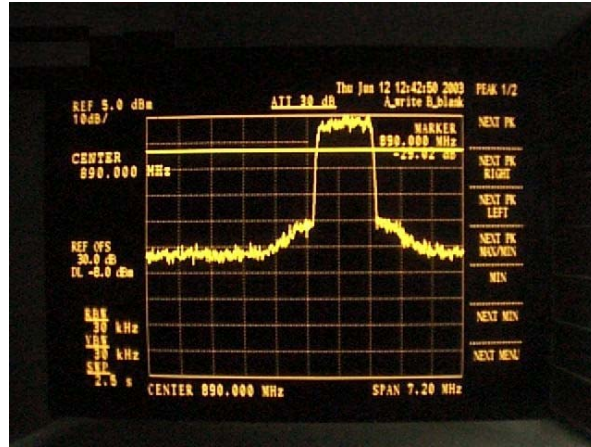
869 MHz-Downlink-Lower Band Edge



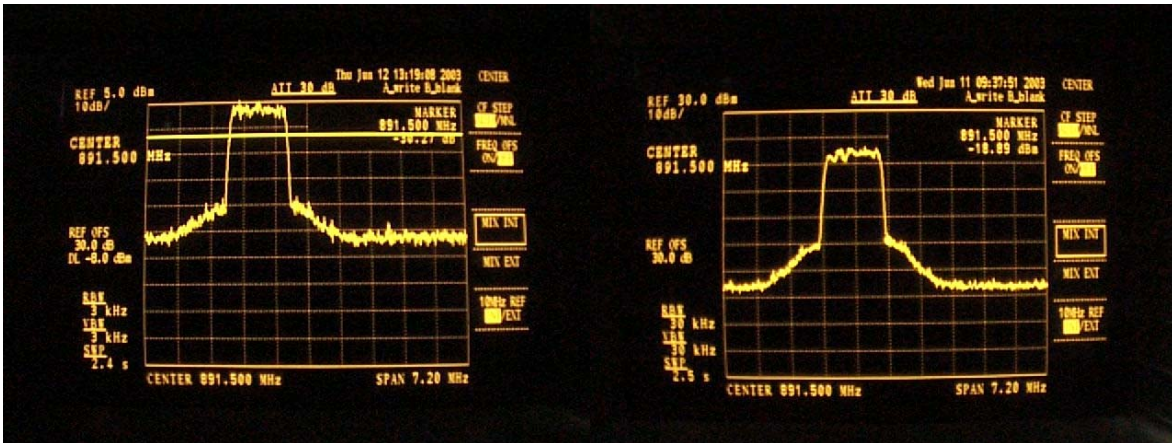
880 MHz-Downlink-Upper Band Edge



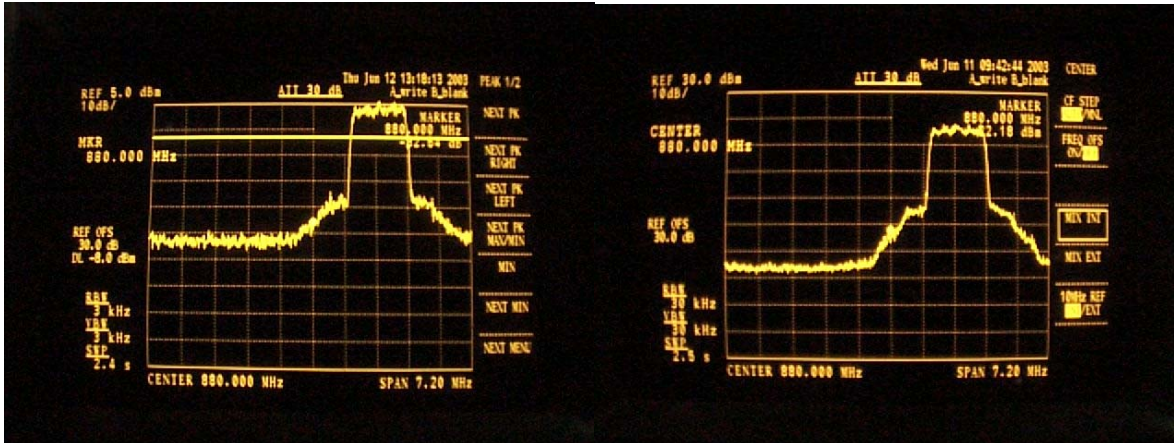
890 MHz-Downlink-Lower Band Edge



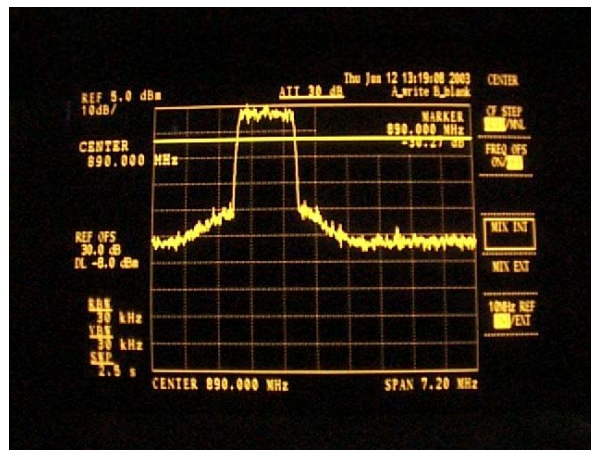
891.5 MHz-Downlink-Upper Band Edge



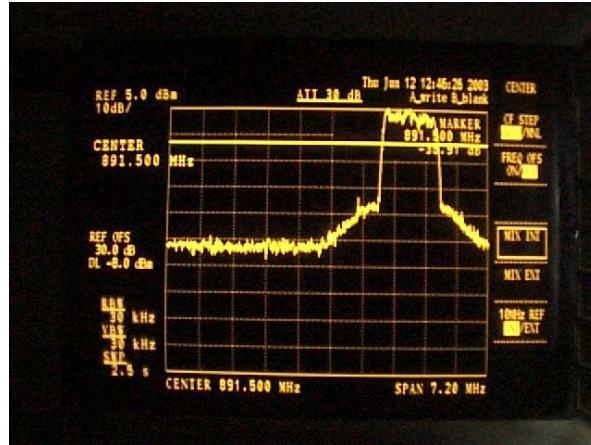
880 MHz-Downlink-Lower Band Edge



890 MHz-Downlink-Upper Band Edge



891.5 MHz-Downlink-Lower Band Edge



894 MHz-Downlink-Upper Band Edge





Transmitter Band Edge Equipment List:

Property Number	Manufacturer	Make	Model	S/N	Cal. Date	Cal. Due
WA527	Advantest	Spectrum Analyzer	RS3271A	45050124	12/16/02	12/16/03
Rental	Hewlett Packard	Signal Generator	E4431B	US39340371	10/12/02	10/12/03



5. Test Equipment:

All test equipment used in the compiling of test data can be found in the test laboratory reports.

6. References:

40371-04-1.VCE	Test Report for EUT
FCC Part 22	FCC part 22- Public Mobile Services
TIA/EIA 603	Land Mobile FM Or PM Communications Equipment Measurement and Performance Standards



Attachment 1, Photographs

EUT Test Setup 1

EUT Test Setup 2

EUT Test Setup 1



EUT Test Setup 2

