

EXHIBIT E-2  
RF PROOF OF PERFORMANCE  
MEASUREMENTS & REPORT

# **Report Of Intermodulation Product Findings**

**Denver, CO.**

<b>KTCL</b>	<b>93.3 MHz.</b>
<b>KPTT</b>	<b>95.7 MHz.</b>
<b>KCUV</b>	<b>102.3 MHz.</b>
<b>KRFX</b>	<b>103.5 MHz.</b>
<b>KALC</b>	<b>105.9 MHz.</b>
<b>KBPI</b>	<b>106.7 MHz.</b>

*April 25, 2007*

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Denver, Colorado

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**REPORT OF FINDINGS****KTCL~KPTT~KCUV~KRFX~KALC~KBPI**

93.3 MHz.~95.7 MHz.~102.3 MHz.~103.5 MHz.~105.9 MHz.~106.7 MHz.

**Introduction:** This report of findings is based on data collected at the KTCL, KPTT, KCUV, KRFX, KALC and KBPI broadcast facility located in Denver, Colorado. The report includes measurements offered as proof that the combined operations of KTCL (93.3 MHz.), KPTT (95.7 MHz.), KCUV (102.3 MHz.), KRFX (103.5 MHz.), KALC (105.9 MHz.) and KBPI (106.7) transmitters are in compliance with the FCC Rules and Regulations as required by the Code of Federal Regulations (CFR) Title 47 section 73.317 paragraph (b) through (d). In brief, the collection of measurements presented in this report shows that all possible third order inter-modulation (IM) products generated by this multiplex system are less than the maximum allowable level as required by section 73.317 (b) through (d). Jeff Taylor of Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized herein on .....

**The following exhibits are provided:**

## Exhibit A:

- A-1 Drawing Depicting Antenna.
- A-2 1082-8CP-DA Antenna Specification Sheet.
- A-3 Drawing Depicting Multiplexing Scheme.
- A-4 ERI Constant Impedance Combiner Specification Sheet.
- A-5 Theoretical Vertical Plane Relative Field Antenna Plots

## Exhibit B:

- B-1 Equipment Employed In Intermodulation Product Measurement.
- B-2 Broadcasting Scheme of the Multiplexed Systems.
- Table 1. Carrier Reference Levels.
- Table 2. Calculated Third Order Products.
- Table 3. Intermodulation Analysis Measurements.

**Exhibits Accompanying Report:** Exhibit A provides comprehensive information on both antenna and filters used by these radio stations. Exhibit B illustrates the broadcasting scheme of each station, the layout of the equipment used to isolate and measure potential intermodulation products and forward carrier reference levels. Found within Table 1 are the narrow band carrier frequency measurements that provide relative output signal levels for the IM analysis. Table 2 lists the calculated third order products that can be generated from FM transmitters broadcasting from the multiplexed system. The IM Analysis Measurements, in Table 3, provides detailed information obtained from the product frequency investigation.

**The Nature of Intermodulation Products (IM):** Intermodulation products result from inadequate transmitter-to-transmitter isolation. Intermodulation products are commonly generated from radio stations operating into multiplexed facilities and congested antenna broadcast sites. The mechanics associated with the phenomenon have been well documented. When two or more transmitters are coupled to each other, new spectral components are produced by the mixing of the station frequencies in the active circuits of each transmitter. The common term used to describe this phenomenon is third order product denoted by the mathematical expression  $[2(F_1)-(F_2)]$ , where  $F_1$  signifies the frequency of the transmitter that is generating the intermodulation product, and  $F_2$  signifies the frequency causing the interference.

**The Multiplexed System:** These measurements were taken with all FM stations operating from the combined antenna system. **At this time KALC 105.9 MHz. was unable to operate from this facility. All testing for this station will be completed at a later date.** The KTCL, KPTT, KCUV, KRFX, KALC, and KBPI multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The 1082-8CP-DA (antenna) and ERI 973/963 constant impedance combiner units are products of Electronics Research, Inc, whereas the feed line is manufactured by Myat. Refer to Exhibit B-1, for an illustration of the Broadcasting Scheme of these stations.

To accomplish the aggregation of six transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of a Constant Impedance Combiner was installed. Specifically, the Multiplexer utilizes one ERI Model CI963-8-GD, one ERI Model CI973-6, two ERI Model CI 963-8, one ERI Model CI973-8, and one 963-4 Bandpass filter modules for each transmitter. An interconnecting U-link is required to complete the multiplexer which is illustrated in the attached Exhibit A-3. The multiplexer, fully assembled, exhibited transmitter port-to-port isolation in excess of -48 dB. Other performance measurements, such as match, loss, group-delay, etc, revealed that the multiplexer unit was in proper working condition. Refer to Exhibit A-4 for the Combiner Specification Sheet.

**The IM Investigation:** Directional Couplers were placed at key locations throughout the combiner to monitor and maintain the multiplexer's performance. All couplers furnished with the system are factory calibrated and capable of delivering accurate and repeatable RF measurements. To facilitate the taking of the measurements, the coupler located at the antenna output of the multiplexed system was used. Care was taken in the selection of the measurement location to insure that the measurements would be made far removed from transmitters and any filtering used to reduce broadcast emissions. The coupler selected would normally be used for antenna reflection measurements and thus would provide greater than -40 dB directivity and a forward signal sample of -60 dB.

The forward port of the coupler was used for sampling the outgoing carrier levels and IM products. The IM sampled signal was fed by shielded cable into a Band Pass Filter where all extraneous energy was steeply attenuated. Various attenuation pads were used, when needed, on the band pass filter and/or the FIM71 to ensure an adequate signal level for measurements without overloading the measurement equipment. A Potomac Instruments FIM-71 Field Strength Receiver Serial # 242 was employed to record the level of all signals investigated. To facilitate the selective tuning of the Receiver and Band Pass Filter a Wavetek Model 3000 Serial # 7512028 signal generator was used. An IFR Model 2399A Spectrum Analyzer Serial # 02113071 was used to measure the close in spectral attenuation of each carrier and wide band search for any anomalies that may need further investigation. See attached Exhibit B-1 for an illustration of the measurement equipment.

Prior to recording measurements, all pertinent broadcasting equipment including Transmitters, Multiplexer, Feed Line and Antenna were adjusted to optimal performance. Also, it was confirmed before taking any measurements that all stations of concern were operating at their full licensed power level. From the equipment setup described above, the relative output signal level of each stations forward carrier was made. The resulting signal levels of these measurements are listed in Table 1, column labeled "Adjusted Level". This level will be used as the reference level for possible IM products of each carrier and was necessary to confirm that no significant levels of spurious energy, referenced to each carrier, were present from any transmitter operating from the multiplexed system.

**Table 1 - Carrier Reference Levels.**

<b>Carrier Frequency (MHz)</b>	<b>Pad One (dB)</b>	<b>Bandpass Filter Loss (dB)</b>	<b>Full Scale Range (dBμ)</b>	<b>Scale Reading (dB)</b>	<b>Adjusted Level (dBμ)</b>	<b>Notes</b>
<b>KTCL 93.3 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>	<b>8</b>	<b>118</b>	
<b>KPTT 95.7 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>	<b>8.5</b>	<b>117.5</b>	
<b>KCUV 102.3 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>	<b>8.3</b>	<b>97.7</b>	
<b>KRFX 103.5 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>	<b>8.3</b>	<b>117.7</b>	
<b>KALC 105.9 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>			
<b>KBPI 106.7 MHz.</b>	<b>6</b>	<b>-</b>	<b>120</b>	<b>8.2</b>	<b>117.8</b>	

Predictable third-order products due to system harmonics mixed with all on-site interfering frequencies that could be generated from the multiplexed system are calculated and listed in Table 2.

**Table 2 - Third order Products.**

**93.3 95.7 102.3 103.5 106.7**

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<b>89.3</b>	<b> </b>	<b>97.3</b>	<b>102.1</b>	<b>115.3</b>	<b>117.7</b>	<b>124.1</b>
<b>90.1</b>	<b> </b>	<b>96.5</b>	<b>101.3</b>	<b>114.5</b>	<b>116.9</b>	<b>123.3</b>
<b>93.3</b>	<b> </b>	<b>---</b>	<b>98.1</b>	<b>111.3</b>	<b>113.7</b>	<b>120.1</b>
<b>95.7</b>	<b> </b>	<b>90.9</b>	<b>---</b>	<b>108.9</b>	<b>111.3</b>	<b>117.7</b>
<b>99.5</b>	<b> </b>	<b>87.1</b>	<b>91.9</b>	<b>105.1</b>	<b>107.5</b>	<b>113.9</b>
<b>101.1</b>	<b> </b>	<b>85.5</b>	<b>90.3</b>	<b>103.5</b>	<b>105.9</b>	<b>112.3</b>
<b>102.3</b>	<b> </b>	<b>84.3</b>	<b>89.1</b>	<b>---</b>	<b>104.7</b>	<b>111.1</b>
<b>103.5</b>	<b> </b>	<b>83.1</b>	<b>87.9</b>	<b>101.1</b>	<b>---</b>	<b>109.9</b>
<b>105.9</b>	<b> </b>	<b>80.7</b>	<b>85.5</b>	<b>98.7</b>	<b>101.1</b>	<b>107.5</b>
<b>106.7</b>	<b> </b>	<b>79.9</b>	<b>84.7</b>	<b>97.9</b>	<b>100.3</b>	<b>---</b>

Using the equipment previously described the IM product measurements were recorded and are listed in Table 3. The signal levels referenced to the carriers are calculated and listed in the column labeled "Level Referenced to Carrier". Refer to Exhibit B-2 for a layout of the measurement equipment.

## IM Measurements Taken in

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
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### Transmitter Mixes

	93.3		6		6	120	8		118		
	95.7		6		6	120	8.5		117.5		
	102.3		6		6	100	8.3		97.7		
	103.5		6		6	120	8.3		117.7		
	105.9		6		6	120			126		Not operational from this site.
	106.7		6		6	120	8.2		117.8		
79.9	93.3	106.7	6	12	18	20	20	18	118	-100	
80.7	93.3	105.9	6	11.1	17.1	20	20	17.1	118	-100.9	
83.1	93.3	103.5	6	11.6	17.6	20	11.5	26.1	118	-91.9	
84.3	93.3	102.3	6	11.1	17.1	20	20	17.1	118	-100.9	
84.7	95.7	106.7	6	11	17	20	20	17	117.5	-100.5	
85.5	93.3	101.1	6	11.1	17.1	20	20	17.1	118	-100.9	
85.5	95.7	105.9	6	11.1	17.1	20	20	17.1	117.5	-100.4	
87.1	95.7	99.5	6	11.5	17.5	20	20	17.5	117.5	-100	
87.9	95.7	103.5	6	11.5	17.5	20	20	17.5	117.5	-100	
89.1	93.3	102.3	6	10.9	16.9	20	20	16.9	118	-101.1	
90.3	95.7	101.1	6	11	17	20	19	18	117.5	-99.5	
90.9	93.3	95.7	6	11.8	17.8	20	20	17.8	118	-100.2	
91.9	93.3	99.5	6	10.8	16.8	20	20	16.8	118	-101.2	
96.5	102.3	90.1	6	10.6	16.6	20	17.5	19.1	97.7	-78.6	Local Carrier 96.5 MHz. KXPK
97.3	95.7	89.3	6	11.9	17.9	40	19	38.9	117.5	-78.6	Local Carrier 89.3 MHz. KUVO
97.9	102.3	106.7	6	10.9	16.9	20	20	16.9	97.7	-80.8	
98.1	103.5	93.3	6	11.8	17.8	20	20	17.8	117.7	-99.9	
98.7	102.3	105.9	6	10.7	16.7	20	20	16.7	97.7	-81	
100.3	103.5	106.7	6	11.4	17.4	20	2	35.4	117.7	-82.3	Local Carrier 100.3 MHz. KIMN
101.1	95.7	103.5	6	11.3	17.3	60	13.1	64.2	117.5	-53.3	Local Carrier 101.1 MHz. KOSI
101.1	95.7	105.9	6	11.3	17.3	60	13.1	64.2	117.5	-53.3	Local Carrier 101.1 MHz. KOSI
101.3	102.3	90.1	6	10.3	16.3	40	16.8	39.5	97.7	-58.2	Local Carrier 101.1 MHz. KOSI
102.1	103.5	89.3	6	11.3	17.3	20	20	17.3	117.7	-100.4	
103.5	102.3	101.1	6	10.1	16.1	100	1.2	114.9	97.7	17.2	Local Carrier 103.5 MHz. KRFX
104.7	103.5	102.3	6	10.5	16.5	20	20	16.5	117.7	-101.2	

105.1	102.3	99.5	6	10.1	16.1	40	18.5	37.6	97.7	-60.1	Local Carrier 105.1 MHz. KXKL
105.9	103.5	101.1	6	10.3	16.3	40	12.7	43.6	117.7	-74.1	Local Carrier 105.9 MHz. KALC
107.5	103.5	99.5	6	11.2	17.2	20	1.8	35.4	117.7	-82.3	Local Carrier 107.5 MHz. KQKS
107.5	106.7	105.9	6	11.2	17.2	20	1.8	35.4	117.8	-82.4	Local Carrier 107.5 MHz. KQKS
108.9	102.3	95.7	6	10.1	16.1	20	20	16.1	97.7	-81.6	
109.9	106.7	103.5	6	10.4	16.4	20	20	16.4	117.8	-101.4	
111.1	106.7	102.3	6	10.1	16.1	20	20	16.1	117.8	-101.7	
111.3	102.3	93.3	6	10.2	16.2	20	20	16.2	97.7	-81.5	
111.3	103.5	95.7	6	11	17	20	20	17	117.7	-100.7	
112.3	106.7	101.1	6	11.6	17.6	20	20	17.6	117.8	-100.2	
113.7	103.5	93.3	6	10.7	16.7	20	20	16.7	117.7	-101	
113.9	106.7	99.5	6	10.4	16.4	20	20	16.4	117.8	-101.4	
114.5	102.3	90.1	6	10.2	16.2	20	20	16.2	97.7	-81.5	
115.3	102.3	89.3	6	10.1	16.1	20	20	16.1	97.7	-81.6	
116.9	103.5	90.1	6	10.3	16.3	20	20	16.3	117.7	-101.4	
117.7	103.5	89.3	6	10.2	16.2	20	20	16.2	117.7	-101.5	
117.7	106.7	95.7	6	10.2	16.2	20	20	16.2	117.8	-101.6	
120.1	106.7	93.3	6	10.4	16.4	20	20	16.4	117.8	-101.4	
123.3	106.7	90.1	6	10.2	16.2	20	20	16.2	117.8	-101.6	
124.1	106.7	89.3	6	10.1	16.1	20	20	16.1	117.8	-101.7	

Please note the following: The antenna gain figure on page 11 for KCUV 102.3 MHz. was supplied by Elliott Klein of Klein Broadcasting Engineering, LLC.

The Spectrum Analyzer was used to check the close in spectral attenuation of the carrier to confirm the operation of the transmitter is in compliance with Sections (b) and (c) of the FCC Rules and Regulations.

As a final proof of the systems IM Product performance, a wide band search was undertaken using the Spectrum Analyzer. The purpose for this measurement was to look for suspicious anomalies that may warrant further investigation. My search ranged the complete frequency span of the receiver and resulted in no additional investigations.

**Conclusion:** Based upon my observations and measurements taken on April 23, 2007 as summarized in this document, I, Jeff Taylor, find the subject system-specifically the transmitter and filter system for the operation of KTCL, KPTT, KCUV, KRFX, and KBPI into the antenna to be in proper working order. Furthermore, based on the measured data, it is my opinion that there are no inter-modulation products in excess of 80 dB below carrier levels generated from or within the station operating on the installed system. Based on this recorded data, I conclude that KTCL, KPTT, KCUV, KRFX, and KBPI is in compliance with the requirements of Section 73.317 paragraph (b) through (d) of the FCC Rules and Regulations.

Respectfully submitted,  
Electronics Research, Inc.

Jeff Taylor, Field Technician



State of Indiana)

) SS:

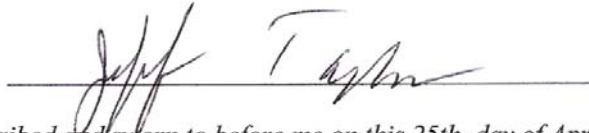
County of Warrick)

**AFFIDAVIT**

I, Jeff Taylor, hereby declare that the following statements are true and correct to the best of my knowledge and belief :

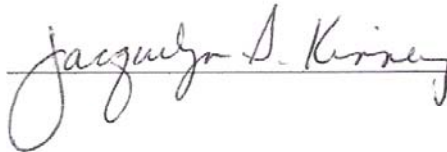
- 1.) I am a Field Technician for Electronics Research, Inc ("ERI ") and have been employed by ERI for 10 years. I am familiar with and have assisted in the design, manufacturing and installation of FM Antennas and FM Multiplexers in my long tenure with ERI.
- 2.) I have either prepared and/or directly supervised the preparation of all technical information contained in this Report of Findings and to my knowledge to be accurate and true.
- 3.) ERI has been requested by Clear Channel Communications and NRC Broadcasting on behalf of radio Stations KTCL, KPTT, KCUV, KRFX, and KBPI in Denver, Colorado to prepare this Report of Findings.

Jeff Taylor; Field Technician

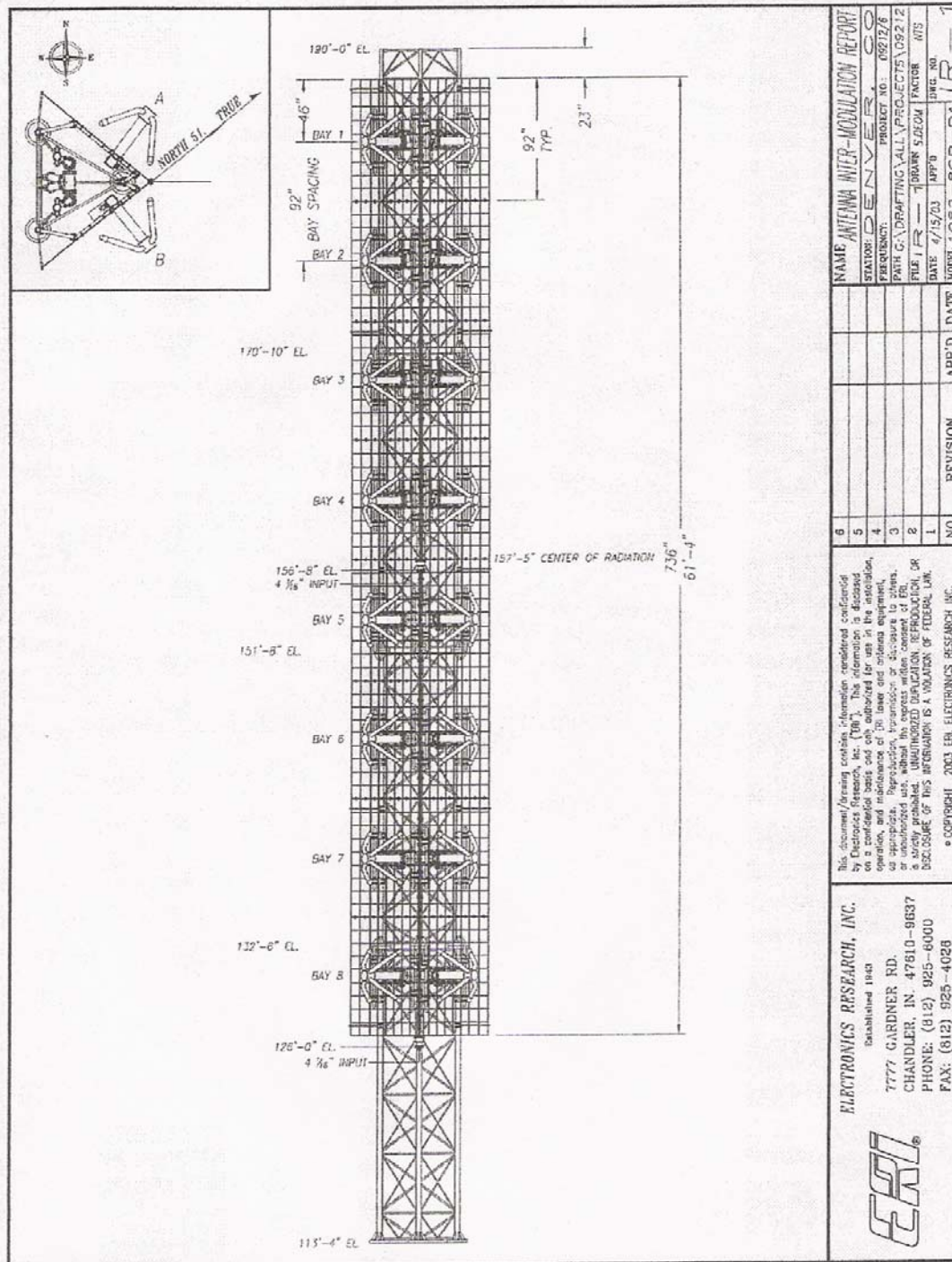


*Subscribed and sworn to before me on this 25th, day of April 2007.*

Jacquelyn Kinney; Notary Public  
My commission expires July 5, 2007







**A-2 ERI Antenna Specification Sheet**

Denver, Colorado

**General Specifications**

Antenna Type ..... High Power FM-Broadcast, Suitable For Multiplexing  
 Model Number ..... 1082-8CP-DA  
 Number of Bay Levels ..... Eight  
 Polarization..... Right Hand Circular

**Electrical Specifications**

Antenna Input Power Capability ..... 67 KW Max <sup>(1)</sup>  
 Operating Frequency Band..... 93.3 ~ 106.7 Megahertz.  
 VSWR. .... <1.1:1 @ Operating Frequencies<sup>(2)</sup>  
 Azimuthal Pattern Circularity ..... Better Than +/- 1.5dB From RMS ( Free Space )  
 Power Split ..... 50/50 ( Horizontal & Vertical )  
 Frequency Specific Information:

<u>Frequency</u>	<u>Station ERP</u>	<u>Beam Tilt</u>	<u>First Null Fill</u>	<u>Second Null Fill</u>	<u>Power Gain</u>	<u>Line Loss</u> <sup>(3)</sup>	<u>Filter Loss</u> <sup>(4)</sup>	<u>Computed TPO</u>
93.3	100 KW	0°	0 %	0%	6.745	.073 db	.2158 db	15.84 KW
95.7	100 KW	0°	0 %	0%	6.889	.073 db	.2961 db	15.80 KW
102.3	1 KW	0°	0 %	0%	7.000	.076 db	.3093 db	156 W
103.5	100 KW	0°	0 %	0%	7.162	.076 db	.3541 db	15.41 KW
105.9	25 KW	0°	0 %	0%	7.053	.077 db	.4177 db	3.97 KW
106.7	100 KW	0°	0 %	0%	7.428	.077 db	.5261 db	15.46 KW

**Mechanical Specifications**

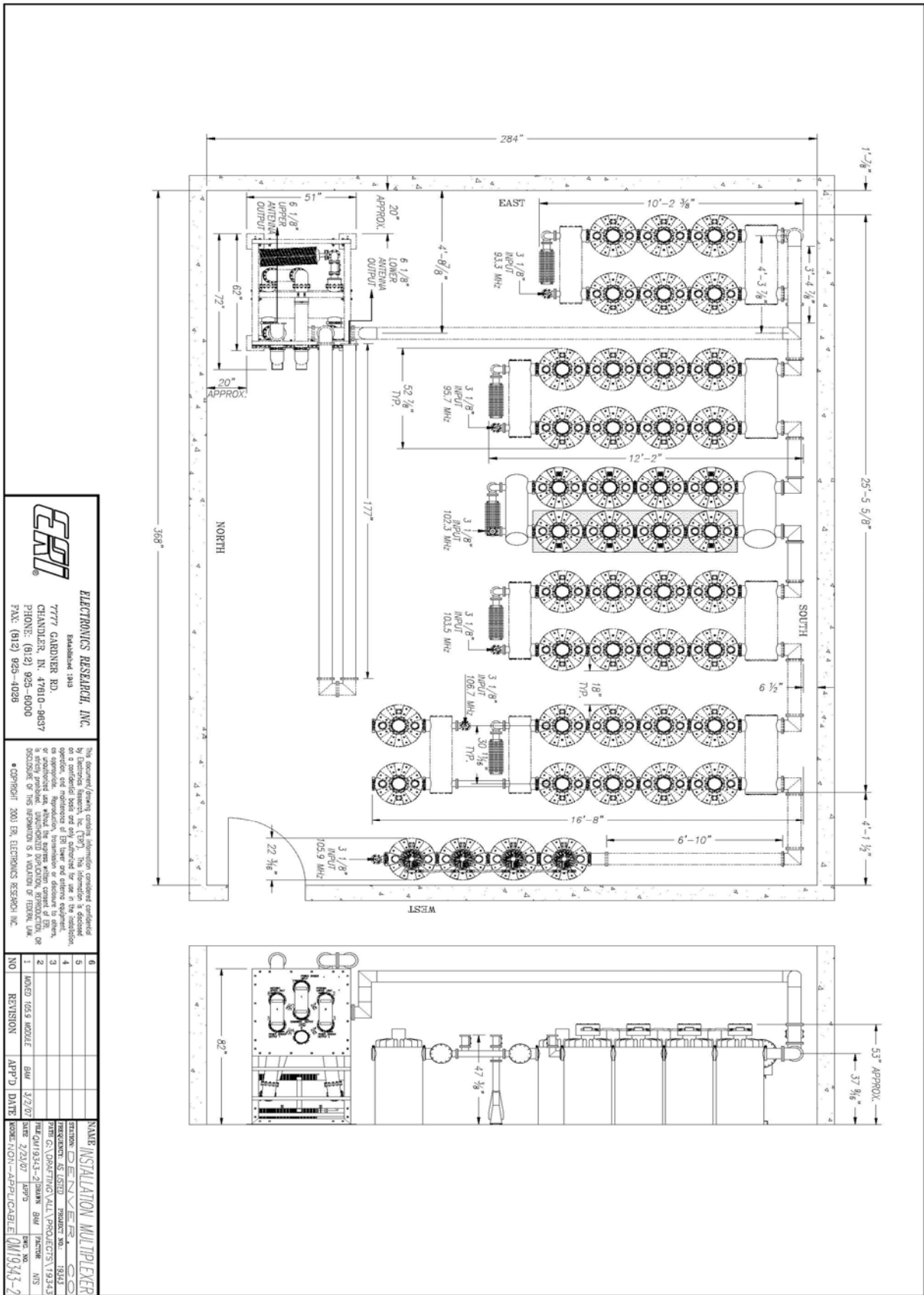
Antenna Feed System.....Fed with Two Lines  
 Input Connector ..... 6 1/8"-50 Ohm EIA Flanged  
 Element Deicing ..... None  
 Interbay Spacing..... 92" Center to Center  
 Array Length ..... 61.33'  
 Construction Material ( Antenna ) ..... All Noncorrosive  
 Construction Material ( Mounting ) ..... All Stainless Steel

1) Power Capability Has Been Rated Assuming an Operating Transmission VSWR of 1.5:1

2) VSWR Specification Achieved After On Site Tuning For User Specific Frequencies.

3) Line Loss Assumes A Feed Run of 148 Feet, 6 1/8" Myat Rigid Line 601-001.

4) Losses Taken From Actual Combiner.



EXHIBIT, A - 3

**A-4 ERI Combiner Specification Sheet**

Denver, Colorado

**General Specifications:**

Multiplexer Type ..... Constant Impedance  
Number of Combining Units ..... Six  
Injected Port to Injected Port Isolation..... < - 48 dB  
Output Connector ..... 6 1/8 "50 Ohm EIA (Flanged)  
Output Power (Designed) ..... 67 KW<sup>(1)</sup>

Heat Removal for 93.3, 95.7, 102.3, 103.5 & 106.7 MHz. .... Natural Convection  
Heat Removal for 105.9 MHz. .... Forced Air Cooling  
Physical Arrangement..... All Components floor standing

**Injected Port Specifications:**

Frequency Assignment ..... 93.3, 95.7, 102.3, 103.5, 105.9 and 106.7 MHz.  
Power Rating, Each Injected Port ..... 16.1 KW for 93.3, 95.7, 102.3, 103.5 & 106.7 MHz.  
Power Rating, Each Injected Port ..... 4.2 KW for 105.9 MHz.  
Input Connector ..... 3-1/8" 50 Ohm EIA (Flanged)  
VSWR..... < 1.09:1 @ +/-200 KHz.<sup>(2)</sup>  
Group Delay ..... Less than 275 ns Overall Variation, Carrier @ +/- 150 KHz.  
Insertion Loss (Measured):

93.3 MHz..... - 0.2158 dB  
95.7 MHz..... - 0.2961 dB  
102.3 MHz..... - 0.3093 dB  
103.5 MHz..... - 0.3541 dB  
105.9 MHz..... - 0.4177 dB  
106.7 MHz..... - 0.5261 dB

1) Power Rating Listed is as Designed Only. Actual Power Capabilities May Vary.

2) When Terminated in 50 Ohm Resistive Load.

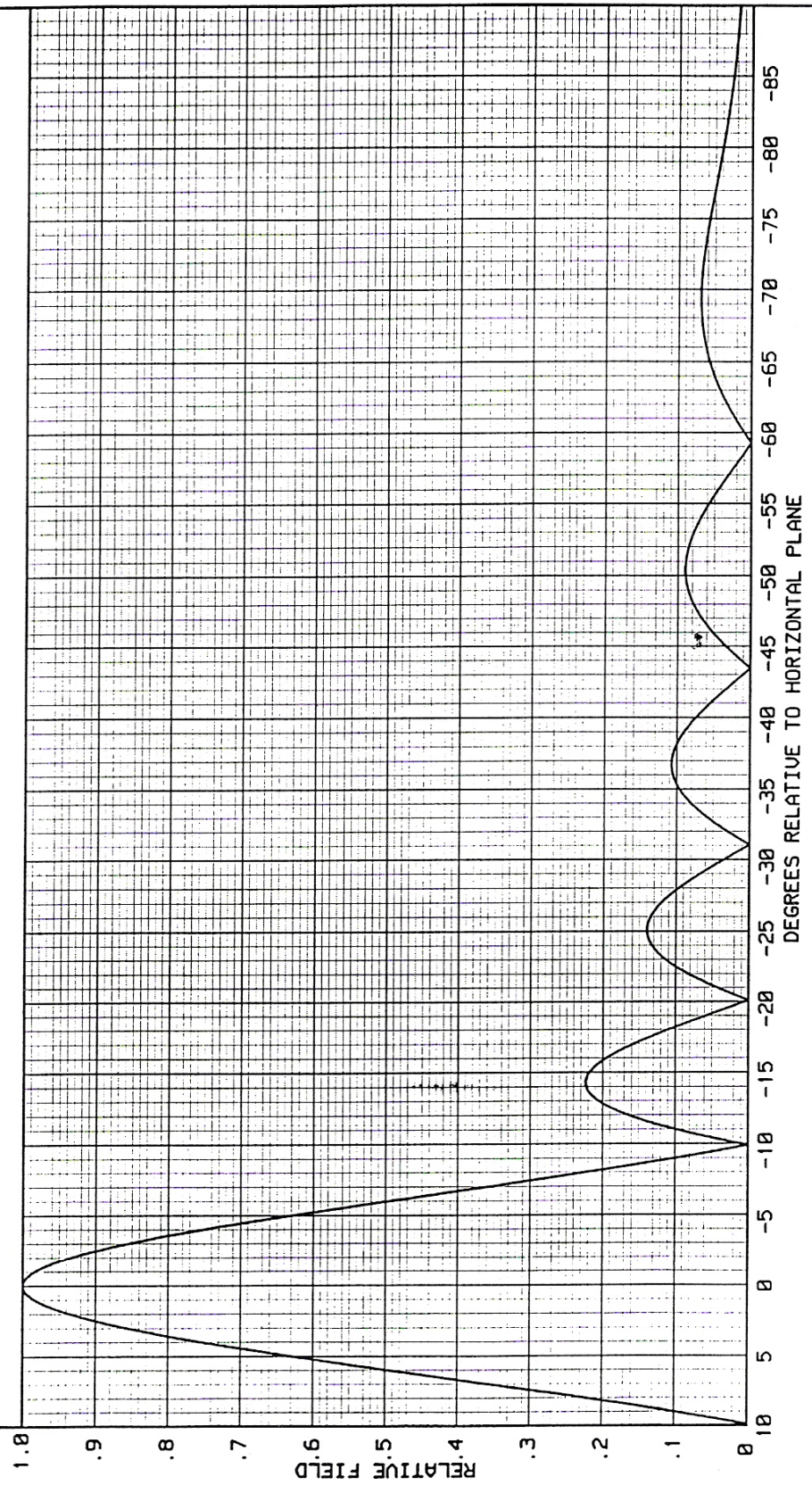


ELECTRONICS RESEARCH, INC.  
7777 GARDNER ROAD  
CHANDLER, IN. 47610

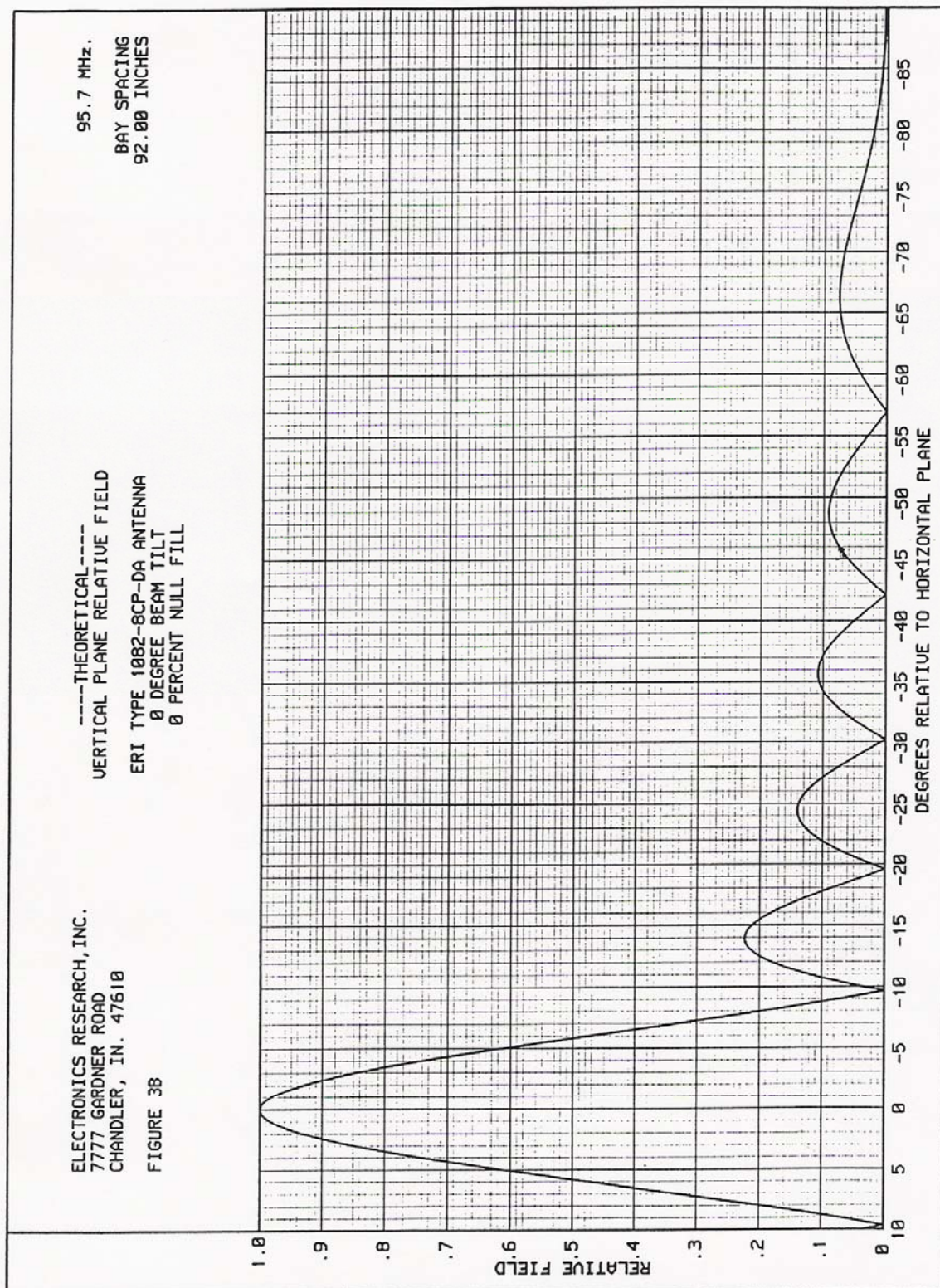
FIGURE 3A

-----THEORETICAL-----  
VERTICAL PLANE RELATIVE FIELD  
ERI TYPE 1082-8CP-DA ANTENNA  
0 DEGREE BEAM TILT  
0 PERCENT NULL FILL

93.3 MHz.  
BAY SPACING  
92.00 INCHES



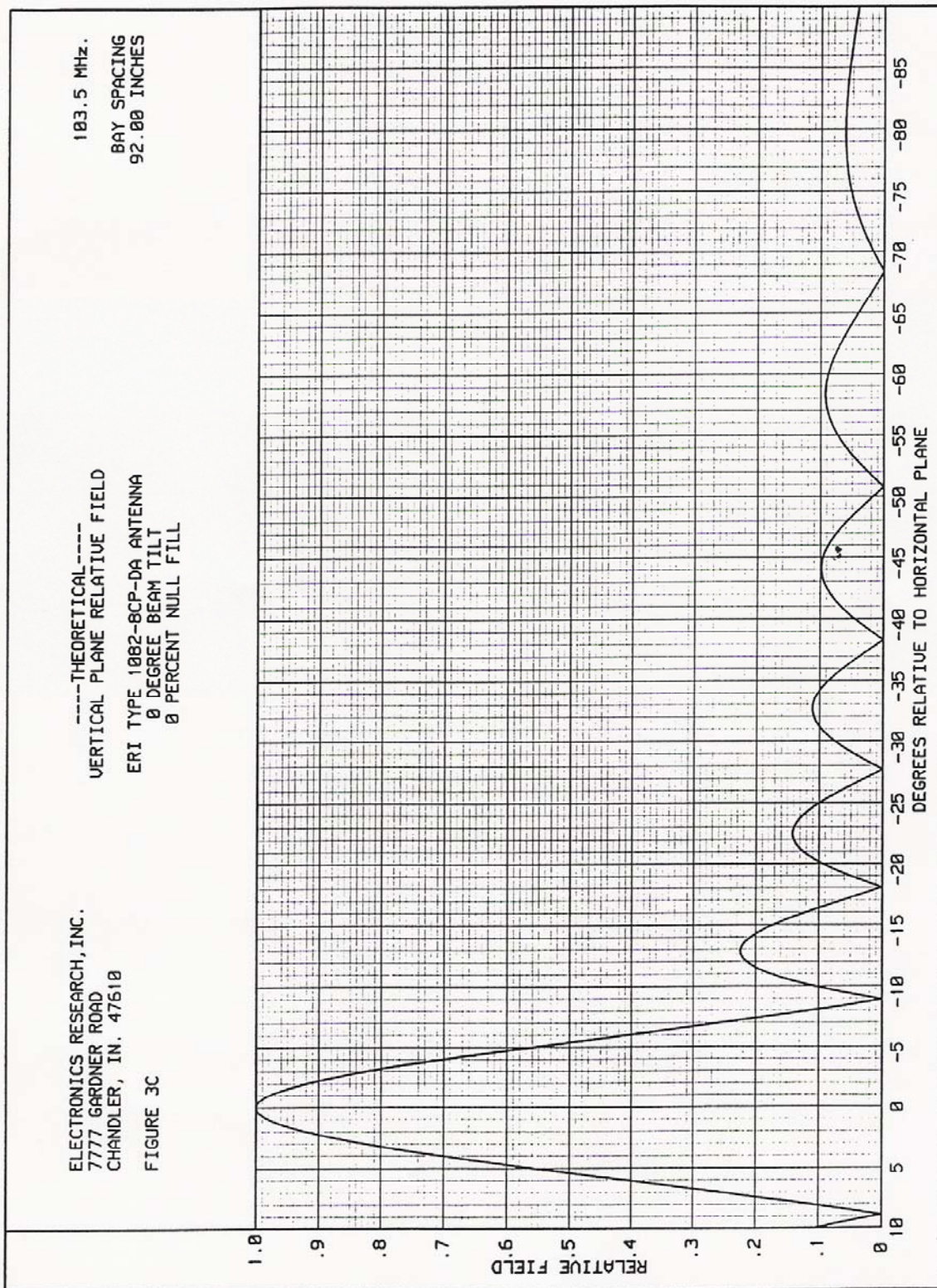




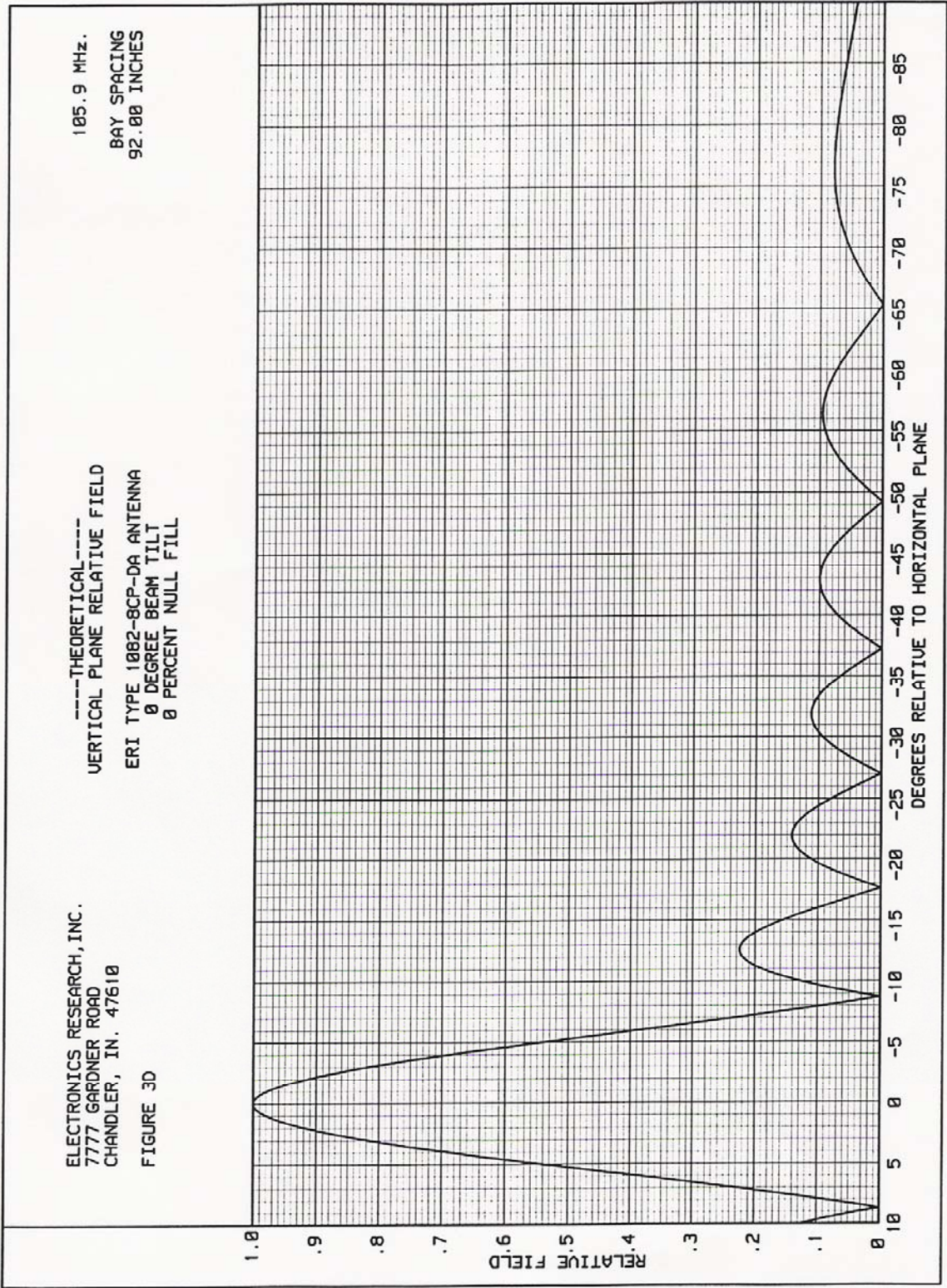
Vertical Plane Relative Field Plot for 102.3 MHz. is not available at this time.

Gain figure for KCUV 102.3 MHz. supplied by Elliott Klein of Klein Broadcasting Engineering, LLC.

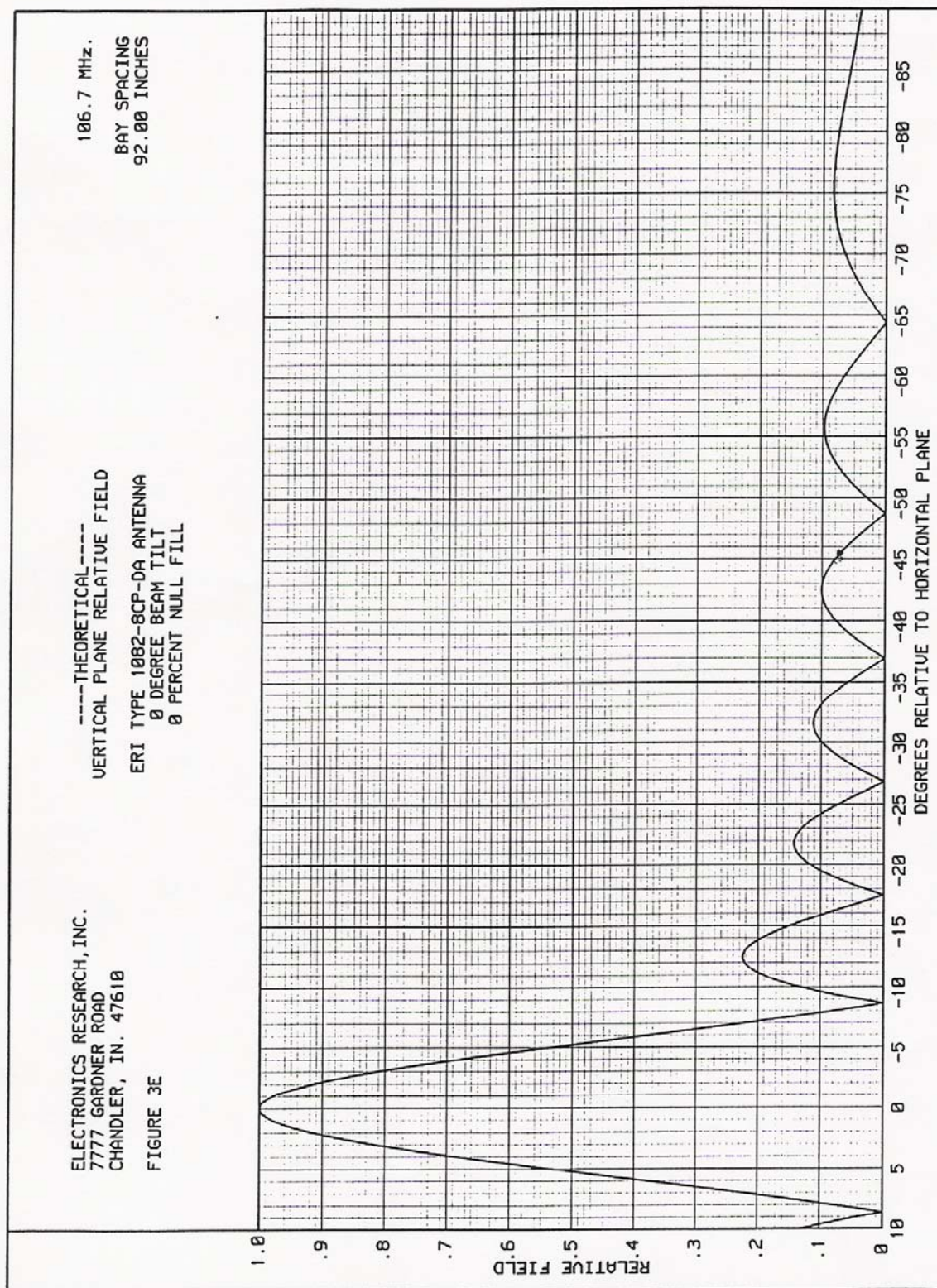


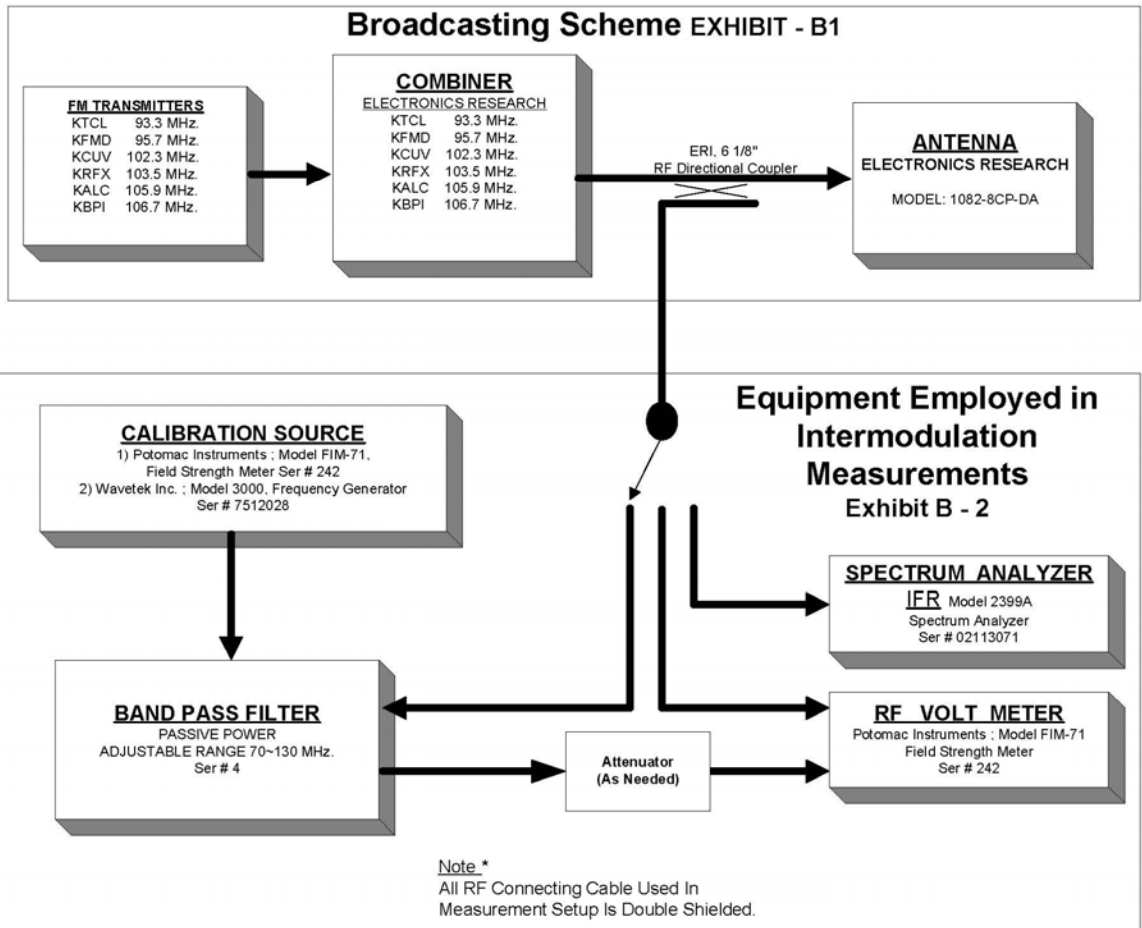












**Broadcasting Scheme and Equipment Employed in Intermodulation Measurements**

**EXHIBIT B**