Report Of

Intermodulation Product Findings

Austin, TX.

KMFA – 89.5 MHz. ~ KUT-FM – 90.5 MHz.
KAMX – 94.7 MHz. ~ KKMJ-FM – 95.5 MHz.
K246BD – 97.1 MHz. ~ KVET – 98.1 MHz.
KUTX-FM – 98.9 MHz. ~ KASE – 100.7 MHz.
KFMK – 105.9 MHz.

Project# 36364 & 36364A

December 10, 2018

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Report of Findings for Intermodulation Product Measurements

Exhibits Accompanying This Report

REPORT OF FINDINGS
AUSTIN, TEXAS
BROADCAST FACILITY

Introduction: This report of findings is based on data collected at the FM broadcast facility located in Austin, TX. The report includes measurements offered as proof that the combined operations of KMFA (89.5 MHz.), KUT-FM (90.5 MHz.), KAMX (94.7 MHz.), KKMJ-FM (95.5 MHz.), K246BD (97.1 MHz.), KVET (98.1 MHz.), KUTX-FM (98.9 MHz.), KASE (100.7 MHz.) and KFMK (105.9 MHz.) 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 multiplexed 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 December 10, 2018.

The following exhibits are provided:

Exhibit A:
- A-1 Drawing Depicting Antenna.
- A-2 Cog 1084-9CP Antenna Specification Sheet.
- A-3 Drawing Depicting Multiplexed Scheme.
- A-4 Multiplexer 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 F2 signifies the frequency causing the interference.

The Multiplexed System: These measurements were taken with all FM stations operating from the combined antenna system. The KMFA, KUT-FM, KAMX, KKMJ-FM, K246BD, KVET, KUTX-FM, KASE and KFMK multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The Cog 1084-9CP (antenna), 955 Bandpass unit, 963, 780, and 783 Constant Impedance combiner units, are products of Electronics Research, Inc. whereas the feedline in manufactured by Dielectric, Inc. Refer to Exhibit B-1, for an illustration of the Broadcasting Scheme of these stations.

To accomplish the aggregation of nine transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of: (1) 955 Bandpass, (6) 963 Constant Impedance, (1) 780 Constant Impedance, (1) 783 Constant Impedance Combiner system was installed. Specifically, the combiner utilizes one ERI Model 955-4 module for frequency (97.1 MHz.), four ERI 963-6 Constant Impedance modules for frequency (89.5 MHz., 98.1 MHz., 100.7 MHz., and 105.9 MHz.), two ERI 963-8 Constant Impedance modules for frequency (94.7 MHz. and 95.5 MHz.), one ERI 780-8 Constant Impedance module for frequency (98.9 MHz.), and one ERI 783-8 Constant Impedance module for frequency (90.5 MHz.). Interconnecting "u-links" are required to complete the combiner which is illustrated in the attached Exhibit A-3. The multiplexer, fully assembled, exhibited transmitter port-to-port isolation in excess of -41 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 ensure 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 -30 dB directivity and a forward signal sample of -46 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 Spectrum Analyzer to ensure an adequate signal level for measurements without overloading the measurement equipment. An IFR 2399A Spectrum Analyzer serial# 02113071 was employed to record the level of all signals investigated. A Rohde & Schwarz ZVL3 Network Analyzer serial# 100396 was used for selective tuning of the Band Pass Filter. The IFR Spectrum Analyzer was also 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 transmitters were operating at full licensed power. 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.

Carrier Frequency (MHz)	Pad One (dB)	Full Scale Range (dB)	Scale Reading (dBm)	**Carrier Level (dBm)**	Notes
KMFA 89.5	**19**	**---**	**4.8**	**23.8**	
KUT-FM 90.5	**19**	**---**	**2.4**	**21.4**	
KAMX 94.7	**19**	**---**	**8.2**	**27.2**	
KKMJ-FM 95.5	**19**	**---**	**5.2**	**24.2**	
K246BD 97.1	**19**	**---**	**-16.4**	**2.6**	
KVET 98.1	**19**	**---**	**5.3**	**24.3**	
KUTX-FM 98.9	**19**	**---**	**-9.1**	**9.9**	
KASE 100.7	**19**	**---**	**-3.1**	**15.9**	
KFMK 105.9	**19**	**---**	**-3.8**	**15.2**	

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.

	Carrier Frequencies								
Interfering Frequencies	**89.5**	**90.5**	**94.7**	**95.5**	**97.1**	**98.1**	**98.9**	**100.7**	**105.9**
89.5 MHz.	----	91.5	99.9	101.5	104.7	106.7	108.3	111.9	122.3
90.5 MHz.	88.5	----	98.9	100.5	103.7	105.7	107.3	110.9	121.3
94.7 MHz.	84.3	86.3	----	96.3	99.5	101.5	103.1	106.7	117.1
95.5 MHz.	83.5	85.5	93.9	----	98.7	100.7	102.3	105.9	116.3
97.1 MHz.	81.9	83.9	92.3	93.9	----	99.1	100.7	104.3	114.7
98.1 MHz.	80.9	82.9	91.3	92.9	96.1	----	99.7	103.3	113.7
98.9 MHz.	80.1	82.1	90.5	92.1	95.3	97.3	----	102.5	112.9
100.7 MHz.	78.3	80.3	88.7	90.3	93.5	95.5	97.1	----	111.1
105.9 MHz.	73.1	75.1	83.5	85.1	88.3	90.3	91.9	95.5	----

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.

Table 3 – Intermodulation Measurements

IM Measurements Taken in Austin, Texas										
Product Frequency (MHz)	**Transmitter Frequency (MHz)**	**Interfering Frequency (MHz)**	**Pad (dB)**	**Bandpass Filter Loss (dB)**	**Total Loss**	**Measured Level (dB)**	**Adjusted Level (dB)**	**Carrier Reference Level (dB)**	**Level Referenced to Carrier (dB)**	**Notes***
Transmitter Mixes										
	89.5	**Ref.**	19		19	4.8	23.8	**23.8**		
	90.5	**Ref.**	19		19	2.4	21.4	**21.4**		
	94.7	**Ref.**	19		19	8.2	27.2	**27.2**		
	95.5	**Ref.**	19		19	5.2	24.2	**24.2**		
	97.1	**Ref.**	19		19	-16.4	2.6	**2.6**		
	98.1	**Ref.**	19		19	5.3	24.3	**24.3**		
	98.9	**Ref.**	19		19	-9.1	9.9	**9.9**		
	100.7	**Ref.**	19		19	-3.1	15.9	**15.9**		
	105.9	**Ref.**	19		19	-3.8	15.2	**15.2**		
73.1	89.5	105.9	3	12.2	15.2	-88.94	-73.74	23.8	**-97.54**	
75.1	90.5	105.9	3	12.1	15.1	-88.1	-73	21.4	**-94.4**	
78.3	89.5	100.7	3	11.7	14.7	-90.2	-75.5	23.8	**-99.3**	
80.1	89.5	98.9	3	11.9	14.9	-88.89	-73.99	23.8	**-97.79**	
80.3	90.5	100.7	3	11.8	14.8	89.9	104.7	21.4	**83.3**	
80.9	89.5	98.1	3	11.8	14.8	-87.2	-72.4	23.8	**-96.2**	
81.9	89.5	97.1	3	11.8	14.8	-86.4	-71.6	23.8	**-95.4**	
82.1	90.5	98.9	3	11.7	14.7	-89.6	-74.9	21.4	**-96.3**	
82.9	90.5	98.1	3	11.7	14.7	-87.7	-73	21.4	**-94.4**	
83.5	89.5	95.5	3	11.6	14.6	-88.1	-73.5	23.8	**-97.3**	
83.5	94.7	105.9	3	11.6	14.6	-88.1	-73.5	27.2	**-100.7**	
83.9	90.5	97.1	3	11.5	14.5	-88.6	-74.1	21.4	**-95.5**	
84.3	89.5	94.7	3	11.5	14.5	-85.8	-71.3	23.8	**-95.1**	
85.1	95.5	105.9	3	11.7	14.7	-89.08	-74.38	24.2	**-98.58**	
85.5	90.5	95.5	3	11.4	14.4	-88.1	-73.7	21.4	**-95.1**	
86.3	90.5	94.7	3	11.6	14.6	-87.5	-72.9	21.4	**-94.3**	
88.3	97.1	105.9	3	11.3	14.3	-88.3	-74	2.6	**-76.6**	10
88.5	89.5	90.5	3	11.3	14.3	-87.2	-72.9	23.8	**-96.7**	
88.7	94.7	100.7	3	11.2	14.2	-82.1	-67.9	27.2	**-95.1**	
90.3	98.1	105.9	3	11.4	14.4	-82.1	-67.7	24.3	**-92**	1
90.3	95.5	100.7	3	11.2	14.2	-87.9	-73.7	24.2	**-97.9**	1
90.5	94.7	98.9	3	11.3	14.3	-88.8	-74.5	27.2	**-101.7**	1
91.3	94.7	98.1	3	11.3	14.3	-77.6	-63.3	27.2	**-90.5**	
91.5	90.5	89.5	3	11.1	14.1	-86.1	-72	21.4	**-93.4**	
91.9	98.9	105.9	3	11.4	14.4	-88.2	-73.8	9.9	**-83.7**	
92.1	95.5	98.9	3	11.1	14.1	-79.9	-65.8	24.2	**-90**	
92.3	94.7	97.1	3	11.2	14.2	-88.6	-74.4	27.2	**-101.6**	
92.9	95.5	98.1	3	11.1	14.1	-85.1	-71	24.2	**-95.2**	
93.5	97.1	100.7	3	11.1	14.1	-89.8	-75.7	2.6	**-78.3**	10
93.9	94.7	95.5	3	11.2	14.2	-84.1	-69.9	27.2	**-97.1**	
93.9	95.5	97.1	3	11.2	14.2	-84.1	-69.9	24.2	**-94.1**	
95.3	97.1	98.9	3	11.1	14.1	-92.6	-78.5	2.6	**-81.1**	3 &10
95.5	98.1	100.7	3	11.1	14.1	-92.8	-78.7	24.3	**-103**	3

95.5	100.7	105.9	3	11.1	14.1	-92.8	-78.7	15.9	**-94.6**	3
96.1	97.1	98.1	3	11	14	-75.41	-61.41	2.6	**-64.01**	10
96.3	95.5	94.7	3	11.1	14.1	-78.6	-64.5	24.2	**-88.7**	
97.1	98.9	100.7	3	10.9	13.9	-88.7	-74.8	9.9	**-84.7**	4
97.3	98.1	98.9	3	11.1	14.1	-79.6	-65.5	24.3	**-89.8**	
98.7	97.1	95.5	3	10.9	13.9	-89.5	-75.6	2.6	**-78.2**	5 & 6 & 10
98.9	94.7	90.5	3	11	14	-79.7	-65.7	27.2	**-92.9**	1
99.1	98.1	97.1	3	11	14	-84.5	-70.5	24.3	**-94.8**	1
99.5	97.1	94.7	3	11	14	-87.1	-73.1	2.6	**-75.7**	10
99.7	98.9	98.1	3	11	14	-79.7	-65.7	9.9	**-75.6**	10
99.9	94.7	89.5	3	10.9	13.9	-87.3	-73.4	27.2	**-100.6**	
100.5	95.5	90.5	3	11	14	-88.5	-74.5	24.2	**-98.7**	7
100.7	98.1	95.5	3	10.9	13.9	-77.1	-63.2	24.3	**-87.5**	7
100.7	98.9	97.1	3	10.9	13.9	-77.1	-63.2	9.9	**-73.1**	7 & 10
101.5	98.1	94.7	3	10.9	13.9	-76.11	-62.21	24.3	**-86.51**	
101.5	95.5	89.5	3	10.9	13.9	-76.11	-62.21	24.2	**-86.41**	
102.3	98.9	95.5	3	10.9	13.9	-75.4	-61.5	9.9	**-71.4**	11 Local Carrier
102.5	100.7	98.9	3	10.7	13.7	-90.38	-76.68	15.9	**-92.58**	
103.1	98.9	94.7	3	10.7	13.7	-84.8	-71.1	9.9	**-81**	10
103.3	100.7	98.1	3	10.7	13.7	-87.9	-74.2	15.9	**-90.1**	
103.7	97.1	90.5	3	10.8	13.8	-87.5	-73.7	2.6	**-76.3**	10
104.3	100.7	97.1	3	10.5	13.5	-92.1	-78.6	15.9	**-94.5**	
104.7	97.1	89.5	3	10.8	13.8	-88.5	-74.7	15.9	**-90.6**	
105.7	98.1	90.5	3	10.4	13.4	-91.1	-77.7	24.3	**-102**	8
105.9	100.7	95.5	3	10.5	13.5	-91.8	-78.3	15.9	**-94.2**	8
106.7	98.1	89.5	3	10.5	13.5	-86.8	-73.3	24.3	**-97.6**	
106.7	100.7	94.7	3	10.5	13.5	-86.8	-73.3	15.9	**-89.2**	
107.3	98.9	90.5	3	10.4	13.4	-87.1	-73.7	9.9	**-83.6**	
108.3	98.9	89.5	3	10.4	13.4	-86.9	-73.5	9.9	**-83.4**	
110.9	100.7	90.5	3	10.3	13.3	-91.5	-78.2	15.9	**-94.1**	
111.1	105.9	100.7	3	10.3	13.3	-90.2	-76.9	15.2	**-92.1**	
111.9	100.7	89.5	3	10.4	13.4	-89.6	-76.2	15.9	**-92.1**	
112.9	105.9	98.9	3	10.6	13.6	-86.3	-72.7	15.2	**-87.9**	
113.7	105.9	98.1	3	10.3	13.3	-87.97	-74.67	15.2	**-89.87**	
114.7	105.9	97.1	3	10.3	13.3	-88.5	-75.2	15.2	**-90.4**	
116.3	105.9	95.5	3	10.3	13.3	-87.55	-74.25	15.2	**-89.45**	
117.1	105.9	94.7	3	10.3	13.3	-87.9	-74.6	15.2	**-89.8**	
121.3	105.9	90.5	3	10.3	13.3	-88.2	-74.9	15.2	**-90.1**	
122.3	105.9	89.5	3	10.2	13.2	-88.5	-75.3	15.2	**-90.5**	

(1) 90.5 MHz. Off for this measurement.
(2) 94.7 MHz. Off for this measurement.
(3) 95.5 MHz. Off for this measurement.
(4) 97.1 MHz. Off for this measurement.
(5) 98.1 MHz. Off for this Measurement.
(6) 98.9 MHz. Off for this measurement.
(7) 100.7 MHz. Off for this measurement.
(8) 105.9 MHz. Off for this Measurement.
(9) Measurement taken at input of directional coupler of 97.1 MHz. filter.
(10) Low Power rule Section 73.317 paragraph D.

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 December 10, 2018 as summarized in this document, I, Jeff Taylor, find the subject system, specifically the transmitter and filter system for the operation of KMFA, KUT-FM, KAMX, KKMJ-FM, K246BD, KVET, KUTX-FM, KASE and KFMK 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 KMFA, KUT-FM, KAMX, KKMJ-FM, K246BD, KVET, KUTX-FM, KASE and KFMK are 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 22 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 KUT Public Media on behalf of radio Stations KMFA, KUT-FM, KAMX, KKMJ-FM, K246BD, KVET, KUTX-FM, KASE and KFMK in Austin, TX. to prepare this Report Of Findings.

Jeff Taylor; Field Technician

Jeff Taylor

Subscribed and sworn to before me on this 12th, day of December, 2018.

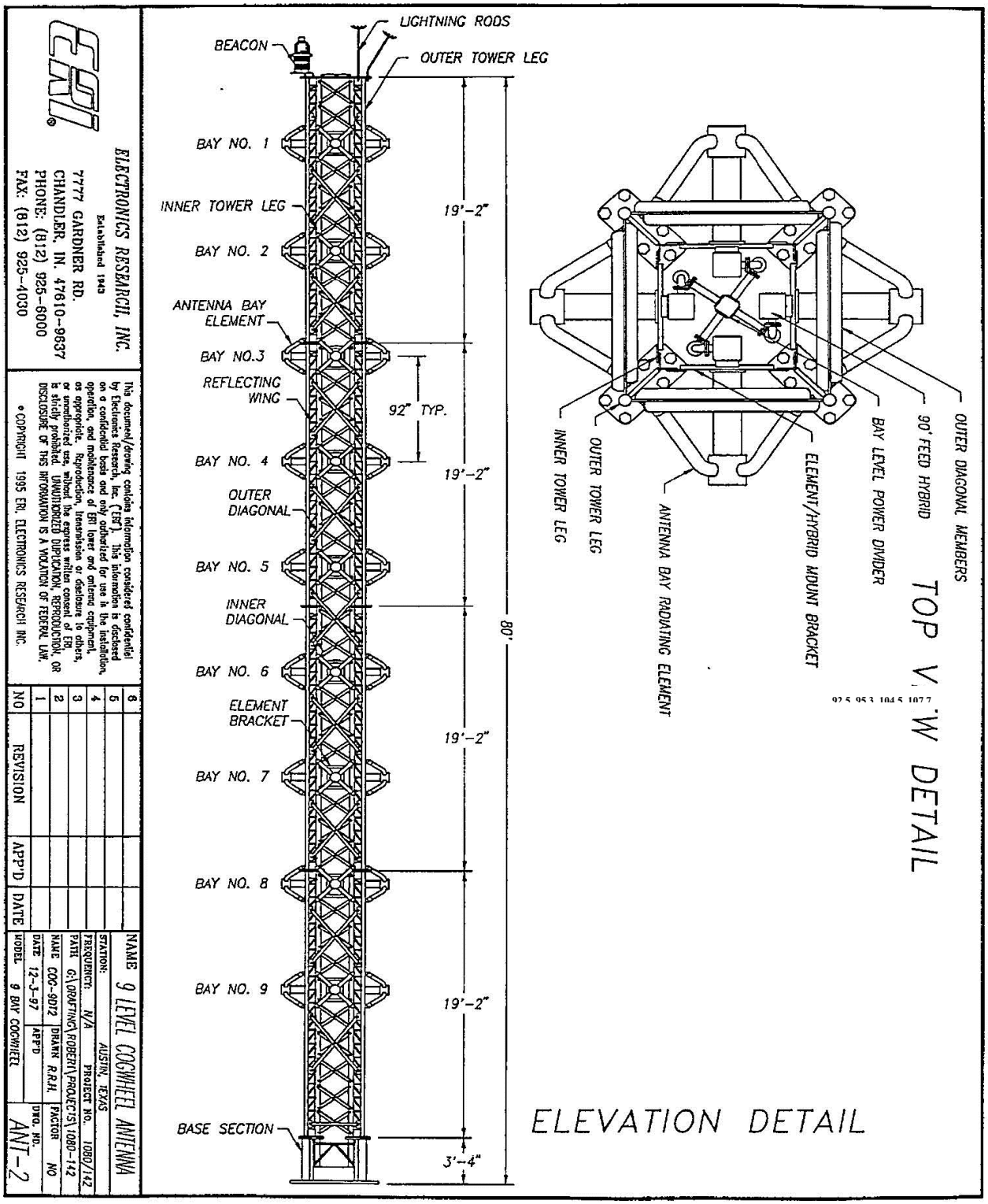
Tabitha Heilman; Notary Public
My commission expires January 2, 2022

Tabitha Lynne Heilman

TABITHA LYNNE HEILMAN
Notary Public, State of Indiana
Warrick County
Commission Number 649993
My Commission Expires
January 02, 2022

EXHIBIT, A-1

EXHIBIT A



A-2 ERI Antenna Specification Sheet

TRANSMISSION SITE
AUSTIN, TEXAS

General Specifications

Antenna Type ……High Power FM-Broadcast, Suitable for Multiplexing
Model Number .....Cog 1084-9CP
Number of Bay Levels.....Nine
Polarization..... Right Hand Circular

Electrical Specifications

Antenna Input Power Capability ……..150 kW Max (1)
Operating Frequency Band..... 89.5 ~ 105.9 Megahertz.
VSWR. …….....<1.22:1 @ Operating Frequencies(2)
Azimuthal Pattern Circularity ..... Better Then +/- 2dB From RMS (Free Space)
Power Split ..... 50/50 (Horizontal & Vertical)
Frequency Specific Information:

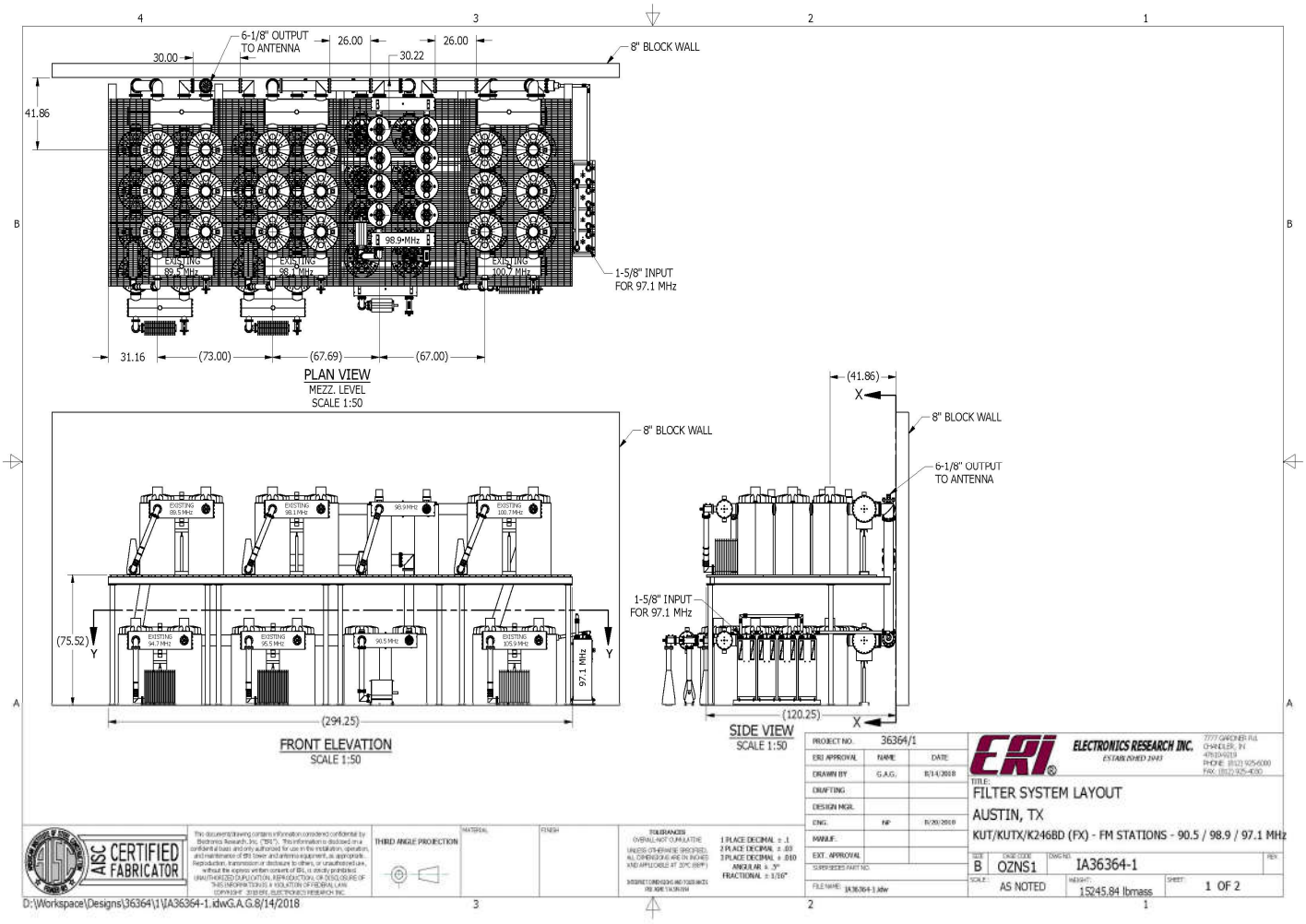
Frequency	Station ERP	Beam Tilt	First Null Fill	Second Null Fill	Power Gain	Line Loss (3)	Filter Loss (4)	Computed TPO
90.5	**24.5 KW**	**-.50°**	**10 %**	**1 %**	**3.599**	**-0.562 dB**	**-0.394 dB**	**8.48 kW**
98.9	**1.600 KW**	**-.50°**	**10 %**	**1 %**	**3.873**	**-0.587 dB**	**-0.773 dB**	**.565 kW**

Mechanical Specifications

Antenna Feed System.....Single Input
Input Connector ……..6 1/8”-50 Ohm EIA Flanged
Element Deicing.....None
Interbay Spacing..... 92” Center to Center
Array Length..... 80 Feet
Construction Material (Antenna)..... Galvanized Plated Steel and 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 1222 Feet of Dielectric DC-675-006 6 1/8” Rigid.
4) Losses Taken From Actual Combiner.

EXHIBIT A-3


6-1/8" OUTPUT TO ANTENNA
8" BLOCK WALL
30.00
26.00
30.22
26.00
41.86
98.9MHz
EXISTING 89.5 MHz
EXISTING 98.1 MHz
EXISTING 100.7 MHz
1-5/8" INPUT FOR 97.1 MHz
31.16
(73.00)
(67.69)
(67.00)
PLAN VIEW
MEZZ. LEVEL
SCALE 1:50
8" BLOCK WALL
(75.52)
97.1 MHz
(294.25)
FRONT ELEVATION
SCALE 1:50
(41.86)
8" BLOCK WALL
6-1/8" OUTPUT TO ANTENNA
1-5/8" INPUT FOR 97.1 MHz
(120.25)
SIDE VIEW
SCALE 1:50
PROJECT NO. 36364/1
ERI APPROVAL
DRAWN BY G.A.G. 8/14/2018
DRAFTING
DESIGN MGR.
ENG. NP 8/20/2018
MANUF.
EXT. APPROVAL
ELECTRONICS RESEARCH INC.
ESTABLISHED 1949
TITLE:
FILTER SYSTEM LAYOUT
AUSTIN, TX
KUT/KUTX/K246BD (FX) - FM STATIONS - 90.5 / 98.9 / 97.1 MHz
SIZE B
CAGE CODE OZNS1
DWG NO. IA36364-1
REV
SCALE: AS NOTED
WEIGHT: 15245.84 lbmass
SHEET: 1 OF 2
AISC CERTIFIED FABRICATOR
THIRD ANGLE PROJECTION
FILE NAME: IA36364-1.idw
D:\Workspace\Designs\36364\1\IA36364-1.idwG.A.G.8/14/2018

A-4 ERI Combiner Specification Sheet

TRANSMISSION SITE
AUSTIN, TEXAS

General Specifications:

Multiplexer Type ..... Band Pass and Constant Impedance
Number of Combining Units ..... Nine
Injected Port to Injected Port Isolation ..... < - 41 dB
Output Connector ..... 6 1/8 "50 Ohm EIA (Flanged)
Output Power (Designed) ..... 113 kW(1)

Heat Removal ..... Natural Convection Cooling
Physical Arrangement ..... Mezzanine and Floor Standing

Injected Port Specifications:

Frequency Assignment ..... 89.5 ~ 105.9 MHz.
Power Rating, Each Injected Port (Designed) ..... 8.48 kW for 90.5 MHz. ~ .565 kW for 98.9 MHz.
Input Connector ..... 3-1/8" 50 Ohm EIA (Flanged).
VSWR ..... < 1.15:1 @ +/-200 KHz.(2)
Group Delay ..... Less than 300 ns Overall Variation, Carrier @ +/- 150 KHz.
Insertion Loss (Measured):

90.5 MHz. ..... - 0.394 dB
98.9 MHz. ..... - 0.773 dB

1) Power Rating Listed is as Designed Only. Actual Power Capabilities May Vary.
2) When Terminated in 50 Ohm Resistive Load.

EXHIBIT A – 5

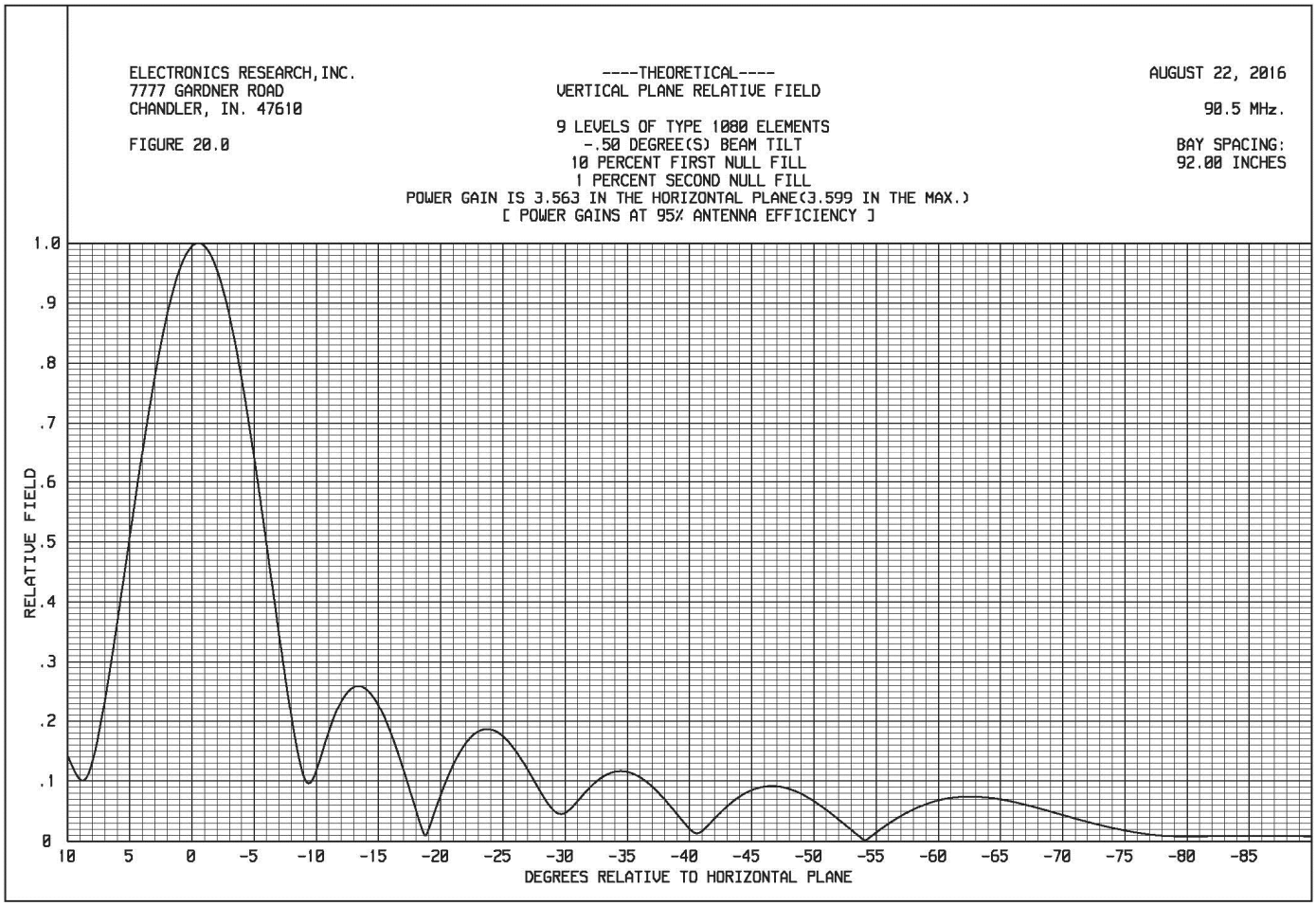
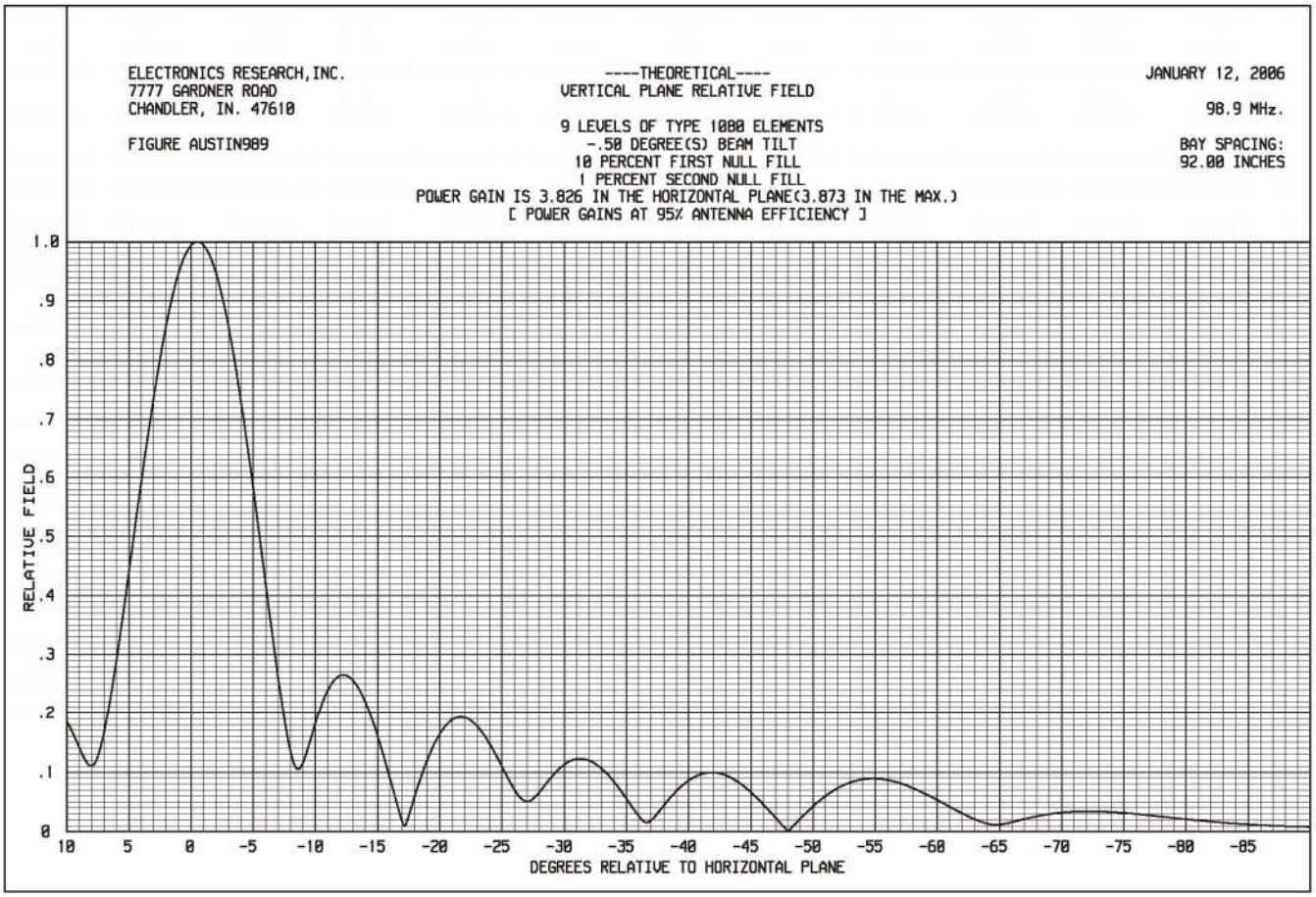
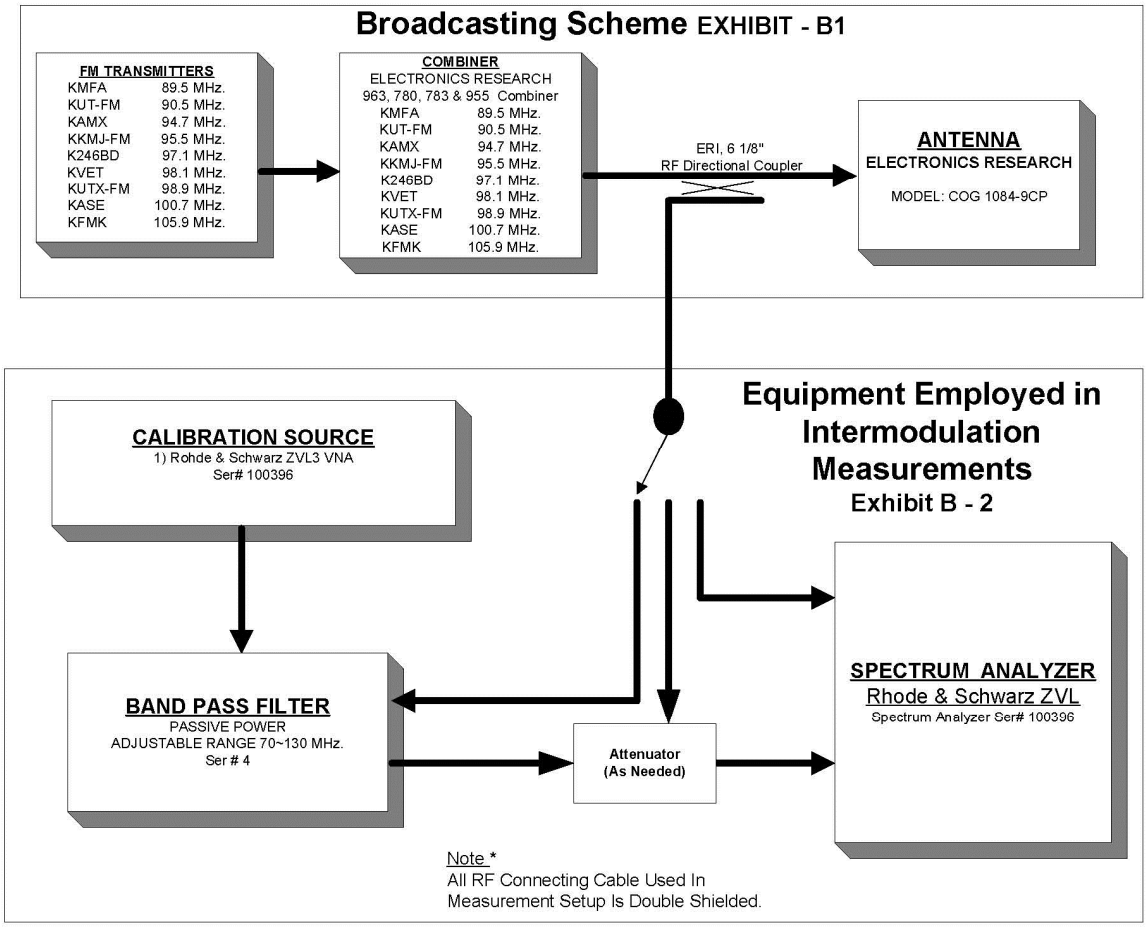

ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE 20.0
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
9 LEVELS OF TYPE 1080 ELEMENTS
-.50 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
1 PERCENT SECOND NULL FILL
POWER GAIN IS 3.563 IN THE HORIZONTAL PLANE(3.599 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]
AUGUST 22, 2016
90.5 MHz.
BAY SPACING:
92.00 INCHES
RELATIVE FIELD
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85
DEGREES RELATIVE TO HORIZONTAL PLANE

EXHIBIT A – 5


ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE AUSTIN989
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
9 LEVELS OF TYPE 1080 ELEMENTS
-.50 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
1 PERCENT SECOND NULL FILL
POWER GAIN IS 3.826 IN THE HORIZONTAL PLANE(3.873 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]
JANUARY 12, 2006
98.9 MHz.
BAY SPACING:
92.00 INCHES
RELATIVE FIELD
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85
DEGREES RELATIVE TO HORIZONTAL PLANE



Broadcasting Scheme and Equipment Employed in Intermodulation Measurements

EXHIBIT B