ELECTRONICS RESEARCH, INC. ERI

Report Of
Intermodulation Product Findings

Geyserville, CA.

KRSH – 95.9 MHz.
KNOB – 96.7 MHz.
KXTS – 98.7 MHz.
KSXY – 100.9 MHz.

Project# 37943

November 18, 2020

Electronics Research Inc.
7777 Gardner Road
Chandler, Indiana 47610
Phone (812) 925-6000 Fax (812) 925- 4030

TABLE OF CONTENTS

Report of Findings for Intermodulation Product Measurements

Exhibits Accompanying This Report

REPORT OF FINDINGS
GEYSERVILLE, CALIFORNIA
BROADCAST FACILITY

Introduction: This report of findings is based on data collected at the FM broadcast facility located in Geyserville, CA. The report includes measurements offered as proof that the combined operations of KRSH (95.9 MHz.), KNOB (96.7 MHz.), KXTS (98.7 MHz.), and KSXY (100.9 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 and single station systems 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 November 18, 2020.

The following exhibits are provided:

Exhibit A:
- A-1 Drawing Depicting Cog Antenna.
- A-2 SHPX-6AC-HW-SP 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 antenna system. The KRSH, KNOB, KXTS, and KSXY, multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The SHPX-6AC-HW-SP antenna, 955-6 Constant Impedance combiner units, 955 Bandpass units, and MACXLine 350 feedline, are products of Electronics Research, Inc.
Refer to Exhibit B-1, for an illustration of the Broadcasting Scheme of these stations.

To accomplish the aggregation of four transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of: (1) 955-6 Constant Impedance combiner module for frequency 100.9 MHz, (2) 955-4 Bandpass units for frequencies 95.9 and 96.7 MHz, and (1) 955-3 Bandpass unit for frequency 98.7 MHz. Interconnecting "T's" on the output of the bandpass filters into the broad port of the constant impedance combiner 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 -44 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 -39 dB directivity and a forward signal sample of -41 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. A Rohde & Schwarz Spectrum Analyzer serial# 103069 was employed to record the level of all signals investigated. A Rohde & Schwarz Network Analyzer serial# 100396 was used for selective tuning of the Band Pass Filter. The Rohde & Schwarz 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
KRSH 95.9	**3**	**---**	**13.6**	**16.6**	
KNOB 96.7	**3**	**---**	**13.5**	**16.5**	
KXTS 98.7	**3**	**---**	**13.9**	**16.9**	
KSXY 100.9	**3**	**---**	**13.9**	**16.9**	

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	**95.9**	**96.7**	**98.7**	**100.9**
95.9 MHz.	----	97.5	101.5	105.9
96.7 MHz.	95.1	----	100.7	105.1
98.7 MHz.	93.1	94.7	----	103.1
100.9 MHz.	90.9	92.5	96.5	----

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 Geyserville, California										
Product Frequency (MHz)	**Transmitter Frequency (MHz)**	**Interfering Frequency (MHz)**	**Pad (dB)**	**Bandpass Filter Loss (dB)**	**Total Loss**	**Measured Level (dBm)**	**Adjusted Level (dBm)**	**Carrier Reference Level (dBm)**	**Level Referenced to Carrier (dBm)**	**Notes***
Transmitter Mixes										
	95.9	**Ref.**	3		3	13.6	16.6	**16.6**		
	96.7	**Ref.**	3		3	13.5	16.5	**16.5**		
	98.7	**Ref.**	3		3	13.9	16.9	**16.9**		
	100.9	**Ref.**	3		3	13.9	16.9	**16.9**		
90.9	95.9	100.9	3	12.8	15.8	-85.39	-69.59	16.6	**-86.19**	
92.5	96.7	100.9	3	12.5	15.5	-86.1	-70.6	16.5	**-87.1**	
93.1	95.9	98.7	3	12.6	15.6	-85.7	-70.1	16.6	**-86.7**	
94.7	96.7	98.7	3	12.6	15.6	-83.46	-67.86	16.5	**-84.36**	
95.1	95.9	96.7	3	12.4	15.4	-82.5	-67.1	16.6	**-83.7**	
96.5	98.7	100.9	3	12.4	15.4	-82.03	-66.63	16.9	**-83.53**	
97.5	96.7	95.9	3	12.3	15.3	-82.8	-67.5	16.5	**-84**	
100.7	98.7	96.7	3	12.2	15.2	-82.2	-67	16.9	**-83.9**	
101.5	98.7	95.9	3	12.2	15.2	-83.9	-68.7	16.9	**-85.6**	
103.1	100.9	98.7	3	12.3	15.3	-81.85	-66.55	16.9	**-83.45**	
105.1	100.9	96.7	3	12.1	15.1	-82.7	-67.6	16.9	**-84.5**	
105.9	100.9	95.9	3	12.1	15.1	-85.3	-70.2	16.9	**-87.1**	

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 November 18, 2020 as summarized in this document, I, Jeff Taylor, find the subject system, specifically the transmitters and filter systems for the operation of KRSH, KNOB, KXTS, and KSXY into their respective antennas 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 KRSH, KNOB, KXTS, and KSXY, 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 24 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 Wine Country Radio on behalf of radio Stations KRSH, KNOB, KXTS, and KSXY in Geyserville, CA. to prepare this Report Of Findings.

Jeff Taylor; Field Technician

Jeff Taylor

Subscribed and sworn to before me on this 19th, day of November, 2020.

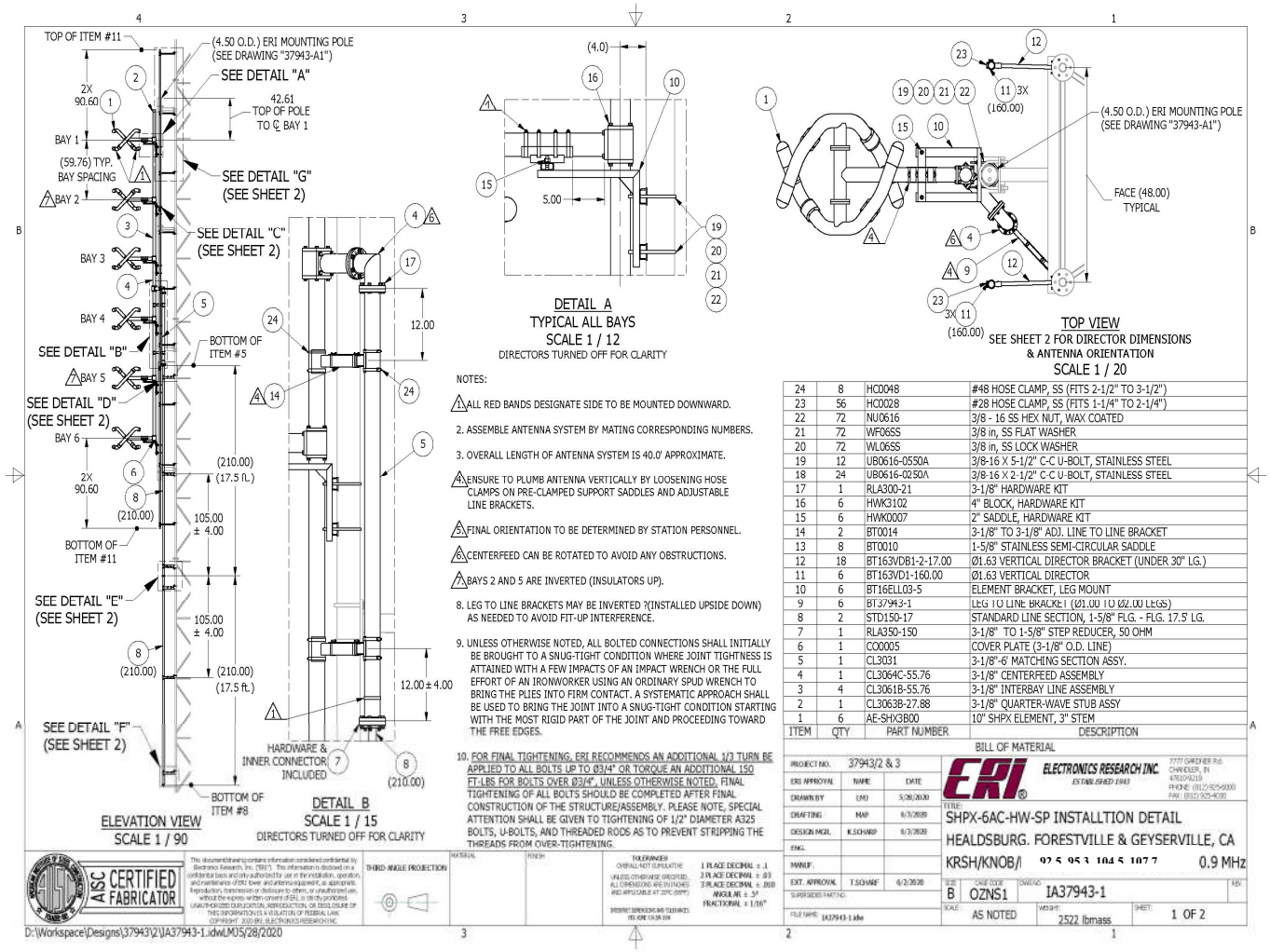
Matt Ruedlinger; Notary Public
Warrick County Commission # 655602
My commission expires July 14, 2022

Matt R

STATE OF INDIANA NOTARY SEAL

MATTHEW J RUEDLINGER
Notary Public, State of Indiana
Warrick County
Commission # 655602
My Commission Expires
July 14, 2022

EXHIBIT, A-1



NOTES:

1. ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD.
2. ASSEMBLE ANTENNA SYSTEM BY MATING CORRESPONDING NUMBERS.
3. OVERALL LENGTH OF ANTENNA SYSTEM IS 40.0' APPROXIMATE.
4. ENSURE TO PLUMB ANTENNA VERTICALLY BY LOOSENING HOSE CLAMPS ON PRE-CLAMPED SUPPORT SADDLES AND ADJUSTABLE LINE BRACKETS.
5. FINAL ORIENTATION TO BE DETERMINED BY STATION PERSONNEL.
6. CENTERFEED CAN BE ROTATED TO AVOID ANY OBSTRUCTIONS.
7. BAYS 2 AND 5 ARE INVERTED (INSULATORS UP).
8. LEG TO LINE BRACKETS MAY BE INVERTED ?(INSTALLED UPSIDE DOWN) AS NEEDED TO AVOID FIT-UP INTERFERENCE.
9. UNLESS OTHERWISE NOTED, ALL BOLTED CONNECTIONS SHALL INITIALLY BE BROUGHT TO A SNUG-TIGHT CONDITION WHERE JOINT TIGHTNESS IS ATTAINED WITH A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF AN IRONWORKER USING AN ORDINARY SPUD WRENCH TO BRING THE PLIES INTO FIRM CONTACT. A SYSTEMATIC APPROACH SHALL BE USED TO BRING THE JOINT INTO A SNUG-TIGHT CONDITION STARTING WITH THE MOST RIGID PART OF THE JOINT AND PROCEEDING TOWARD THE FREE EDGES.
10. FOR FINAL TIGHTENING, ERI RECOMMENDS AN ADDITIONAL 1/3 TURN BE APPLIED TO ALL BOLTS UP TO Ø3/4" OR TORQUE AN ADDITIONAL 150 FT-LBS FOR BOLTS OVER Ø3/4", UNLESS OTHERWISE NOTED. FINAL TIGHTENING OF ALL BOLTS SHOULD BE COMPLETED AFTER FINAL CONSTRUCTION OF THE STRUCTURE/ASSEMBLY. PLEASE NOTE, SPECIAL ATTENTION SHALL BE GIVEN TO TIGHTENING OF 1/2" DIAMETER A325 BOLTS, U-BOLTS, AND THREADED RODS AS TO PREVENT STRIPPING THE THREADS FROM OVER-TIGHTENING.

ITEM	QTY	PART NUMBER	DESCRIPTION
24	8	HC0048	#48 HOSE CLAMP, SS (FITS 2-1/2" TO 3-1/2")
23	56	HC0028	#28 HOSE CLAMP, SS (FITS 1-1/4" TO 2-1/4")
22	72	NU0616	3/8 - 16 SS HEX NUT, WAX COATED
21	72	WF06SS	3/8 in, SS FLAT WASHER
20	72	WL06SS	3/8 in, SS LOCK WASHER
19	12	UB0616-0550A	3/8-16 X 5-1/2" C-C U-BOLT, STAINLESS STEEL
18	24	UB0616-0250A	3/8-16 X 2-1/2" C-C U-BOLT, STAINLESS STEEL
17	1	RLA300-21	3-1/8" HARDWARE KIT
16	6	HWK3102	4" BLOCK, HARDWARE KIT
15	6	HWK0007	2" SADDLE, HARDWARE KIT
14	2	BT0014	3-1/8" TO 3-1/8" ADJ. LINE TO LINE BRACKET
13	8	BT0010	1-5/8" STAINLESS SEMI-CIRCULAR SADDLE
12	18	BT163VDB1-2-17.00	Ø1.63 VERTICAL DIRECTOR BRACKET (UNDER 30" LG.)
11	6	BT163VD1-160.00	Ø1.63 VERTICAL DIRECTOR
10	6	BT16ELL03-5	ELEMENT BRACKET, LEG MOUNT
9	6	BT37943-1	LEG TO LINE BRACKET (Ø1.00 TO Ø2.00 LEGS)
8	2	STD150-17	STANDARD LINE SECTION, 1-5/8" FLG. - FLG. 17.5' LG.
7	1	RLA350-150	3-1/8" TO 1-5/8" STEP REDUCER, 50 OHM
6	1	CO0005	COVER PLATE (3-1/8" O.D. LINE)
5	1	CL3031	3-1/8"-6' MATCHING SECTION ASSY.
4	1	CL3064C-55.76	3-1/8" CENTERFEED ASSEMBLY
3	4	CL3061B-55.76	3-1/8" INTERBAY LINE ASSEMBLY
2	1	CL3063B-27.88	3-1/8" QUARTER-WAVE STUB ASSY
1	6	AE-SHX3B00	10" SHPX ELEMENT, 3" STEM

BILL OF MATERIAL

PROJECT NO.	37943/2 & 3	
ERI APPROVAL	NAME	DATE
DRAWN BY	LMJ	5/28/2020
DRAFTING	MAP	6/3/2020
DESIGN MGR.	K.SCHARP	6/3/2020
ENG.		
MANUF.		
EXT. APPROVAL	T.SCHARP	6/2/2020

ELECTRONICS RESEARCH INC.
ESTABLISHED 1943
7777 GARDNER Rd.
CHANDLER, IN
47610-9210
PHONE: (812) 925-6000
FAX: (812) 925-4030

TITLE:
SHPX-6AC-HW-SP INSTALLTION DETAIL
HEALDSBURG. FORESTVILLE & GEYSERVILLE, CA
KRSH/KNOB/ 92.5 95.3 104.5 107.7 0.9 MHz

SIZE	CAGE CODE	DRAWING	REV.
B	OZNS1	IA37943-1	
SCALE	AS NOTED	WEIGHT: 2522 lbmass	SHEET: 1 OF 2

FILE NAME: IA37943-1.idw

ASC CERTIFIED FABRICATOR

THIRD ANGLE PROJECTION

MATERIAL

FINISH

TOLERANCES
OVERALL NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES AND APPLICABLE AT 20°C (68°F)
1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± 3°
FRACTIONAL ± 1/16"

D:\Workspace\Designs\37943\2\IA37943-1.idw,MJS,28/2020

A-2 ERI 1183 Antenna Specification Sheet

TRANSMISSION SITE
GEYSERVILLE, CA.

General Specifications

Antenna Type ……High Power FM-Broadcast, Suitable For Multiplexing
Model Number SHPX-6AC-HW-SP
Number of Bay Levels ..... Six
Polarization..... Right Hand Circular Polarized

Electrical Specifications

Antenna Input Power Capability . . . . . 6.55 kW Max (1)
Operating Frequency Band ..... 95.9 ~ 100.9 Megahertz.
VSWR. . . . . <1.06:1 @ 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
95.9	**2.75 KW**	**0.0°**	**4.3 %**	**0.0 %**	**1.862**	**-0.099 dB**	**-0.529 dB**	**1.707 kW**
96.7	**2.75 KW**	**0.0°**	**2.9 %**	**0.0 %**	**1.880**	**-0.099 dB**	**-0.528 dB**	**1.690 kW**
98.7	**2.75 KW**	**0.0°**	**0.5 %**	**0.0 %**	**1.918**	**-0.099 dB**	**-0.329 dB**	**1.582 kW**
100.9	**2.75 KW**	**0.0°**	**4.4 %**	**0.0 %**	**1.949**	**-0.101 dB**	**-0.364 dB**	**1.570 kW**

Mechanical Specifications

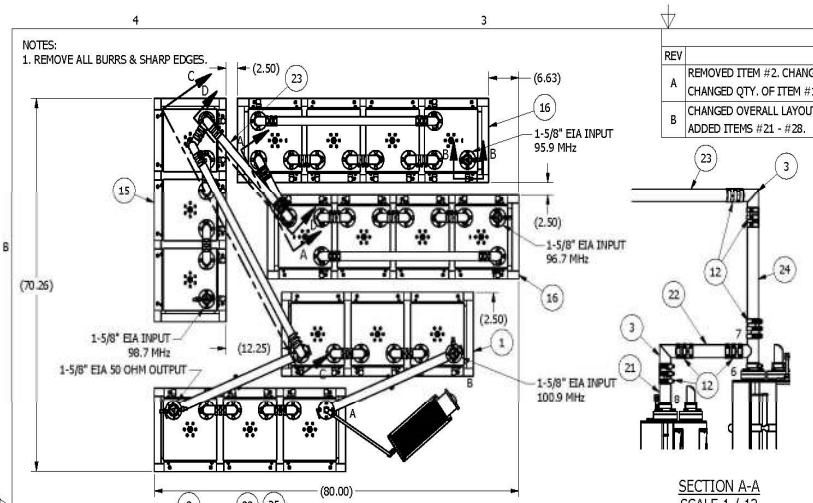
Antenna Feed System.....Single Input
Input Connector ……3 1/8”50-Ohm EIA Flanged
Element Deicing.....None
Interbay Spacing..... 59.76” Center to Center
Array Length ..... 25.15 Feet
Construction Material (Antenna)..... Galvanized Plated Steel and Stainless Steel

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 206 Feet of ERI MACXLine 3 1/8” Rigid 17.5 Foot Sticks.
4) Losses Taken from Actual Combiner.

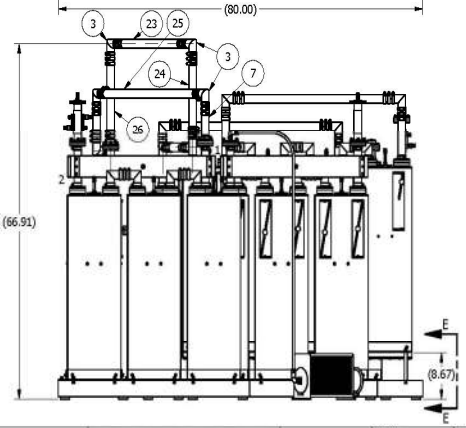
EXHIBIT A-3

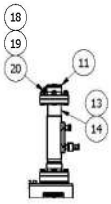
NOTES:
1. REMOVE ALL BURRS & SHARP EDGES.

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	REMOVED ITEM #2. CHANGED QTY. OF ITEM #3, WAS 1. CHANGED LENGTHS OF ITEMS #4, #7, #8 AND #10 CHANGED QTY. OF ITEM #11, WAS 16. CHANGED QTY. OF ITEM #12, WAS 3. REPLACED ITEM #14, WAS CD227.	5/7/2020	NP
B	CHANGED OVERALL LAYOUT, CHANGED QTY. OF ITEM #12, WAS 14. REMOVED ITEMS #4, #8, #9 & #10. ADDED ITEMS #21 - #28.		

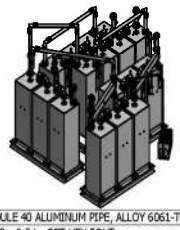


SECTION A-A
SCALE 1 / 12





SECTION B-B
2X TYPICAL
SCALE 1 / 10



ITEM	QTY	PART NUMBER	DESCRIPTION
28	82.70	ALP0037-0040-5.17	3/8" SCHEDULE 40 ALUMINUM PIPE, ALLOY 6061-T6 (.675" O.D.)
27	16	PURCHASED	5/16-18 UNC x 6.5 in, SST HEX BOLT
26	1	1329150-29-5-14.34	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
25	1	1329150-29-5-42.54	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
24	1	1329150-29-5-13.68	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
23	1	1329150-29-5-19.75	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
22	1	1329150-29-5-6.96	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
21	1	1329150-29-5-4.92	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
20	16	SC0518H0125	5/16-18 UNC x 1.25 in, SST HEX BOLT
19	16	WL05SS	5/16 in, SS LOCK WASHER
18	16	NU0518	5/16 - 18 SS HEX NUT, WAX COATED
17	2	CT1018	Ø1-5/8" ALUMINUM TEE ASSY.
16	2	CF230-04NA	955-4 NON-ADJACENT BANDPASS FILTER
15	1	CF230-03	955-3 BANDPASS FILTER
14	3	CD235	1-5/8" COUPLER SINGLE PORT FM EIA AL 8.00 LONG
13	2	CB206	1-5/8" STD INNER CONN 50 OHM
12	16	1329150-39A	UNPRESSURIZED ALUMINUM COUPLING
11	4	1329100-38	1-5/8" ALUMINUM CLAMP TYPE FLANGE ADAPTER
~~X~~	~~X~~	~~1329150-29-5-11.50~~	~~1-5/8" VAR LINE SECTION UNFLG UP TO 60"~~
~~X~~	~~X~~	~~1329150-29-5-20.44~~	~~1-5/8" VAR LINE SECTION UNFLG UP TO 60"~~
~~X~~	~~X~~	~~1329150-29-5-11.88~~	~~1-5/8" VAR LINE SECTION UNFLG UP TO 60"~~
7	1	1329150-29-5-6.27	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
6	1	1329150-29-5-5.00	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
5	1	1329150-29-5-4.26	1-5/8" VAR LINE SECTION UNFLG UP TO 60"
~~X~~	~~X~~	~~1329150-29-5-4.26~~	~~1-5/8" VAR LINE SECTION UNFLG UP TO 60"~~
3	6	1329150-10SE-3	1-5/8" AL 50 OHM 90 DEG ELBOW/UNFLGD
~~X~~	~~X~~	~~1329150-10SE~~	~~1-5/8" 50 OHM SNG. EQUIL. FLG ELBOW~~
1	1	EF37943A-1	INSTALLATION, MULTIPLEXER

BILL OF MATERIAL

PROJECT NO.	37943A/1	
ERI APPROVAL	NAME	DATE
DRAWN BY	LMJ	4/22/2020
DRAFTING		
DESIGN MGR.		
ENG.	NP	5/1/2020
MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
FILE NAME: IM37943A-1.dw		

ELECTRONICS RESEARCH INC.
ESTABLISHED 1947
7777 GARDNER RD.
CHANDLER, IN
47610-9159
PHONE: (812) 925-6000
FAX: (812) 925-4030

TITLE:
INSTALLATION, MULTIPLEXER
HEALDSBURG/FORESTVILLE/GEYSERVILLE, CA
FM STATIONS 95.9, 96.7, 98.7 & 100.9 MHz

SIZE	CAGE CODE	DWG NO.	REV
B	OZNS1	IM37943A-1	B
SCALE: 1/18	WEIGHT: 943 lbmass	SHEET: 1 OF 2	

ASC CERTIFIED FABRICATOR

THIRD ANGLE PROJECTION

TOLERANCES
(UNLESS OTHERWISE SPECIFIED)
ALL DIMENSIONS ARE IN INCHES AND APPLICABLE AT 20°C (68°F)
1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR: ± 5°
FRACTIONAL ± 1/16"
LOG HOLE +0", +1/16"

D:\Workspace\Designs\37943A\1\IM37943A-1.idwLMJ4/22/2020

A-4 ERI Combiner Specification Sheet

TRANSMISSION SITE
GEYSERVILLE, CA.

General Specifications:

Multiplexer Type ..... Constant Impedance, "T", and Branch
Number of Combining Units ..... Four
Injected Port to Injected Port Isolation ..... < - 72 dB
Output Connector ..... 1 5/8 "50 Ohm EIA (Flanged)
Output Power (Designed) ..... 6.55 kW(1)

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

Injected Port Specifications:

Frequency Assignment .....95.9 ~ 100.9 MHz.
Power Rating, Each Injected Port (Designed).....1.7 kW 95.9 MHz, 1.69 kW 96.7 MHz.
Power Rating, Each Injected Port (Designed).....1.58 kW 98.7 MHz, 1.57 kW 100.9 MHz.
Input Connector .....1-5/8" 50 Ohm EIA (Flanged).
VSWR.....< 1.09:1 @ +/-200 KHz.(2)
Group Delay .....Less than 250 ns Overall Variation, Carrier @ +/- 150 KHz.
Insertion Loss (Measured):

95.9 MHz. ..... - 0.529 dB
96.7 MHz. ..... - 0.528 dB
98.7 MHz. ..... - 0.329 dB
100.9 MHz. ..... - 0.364 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

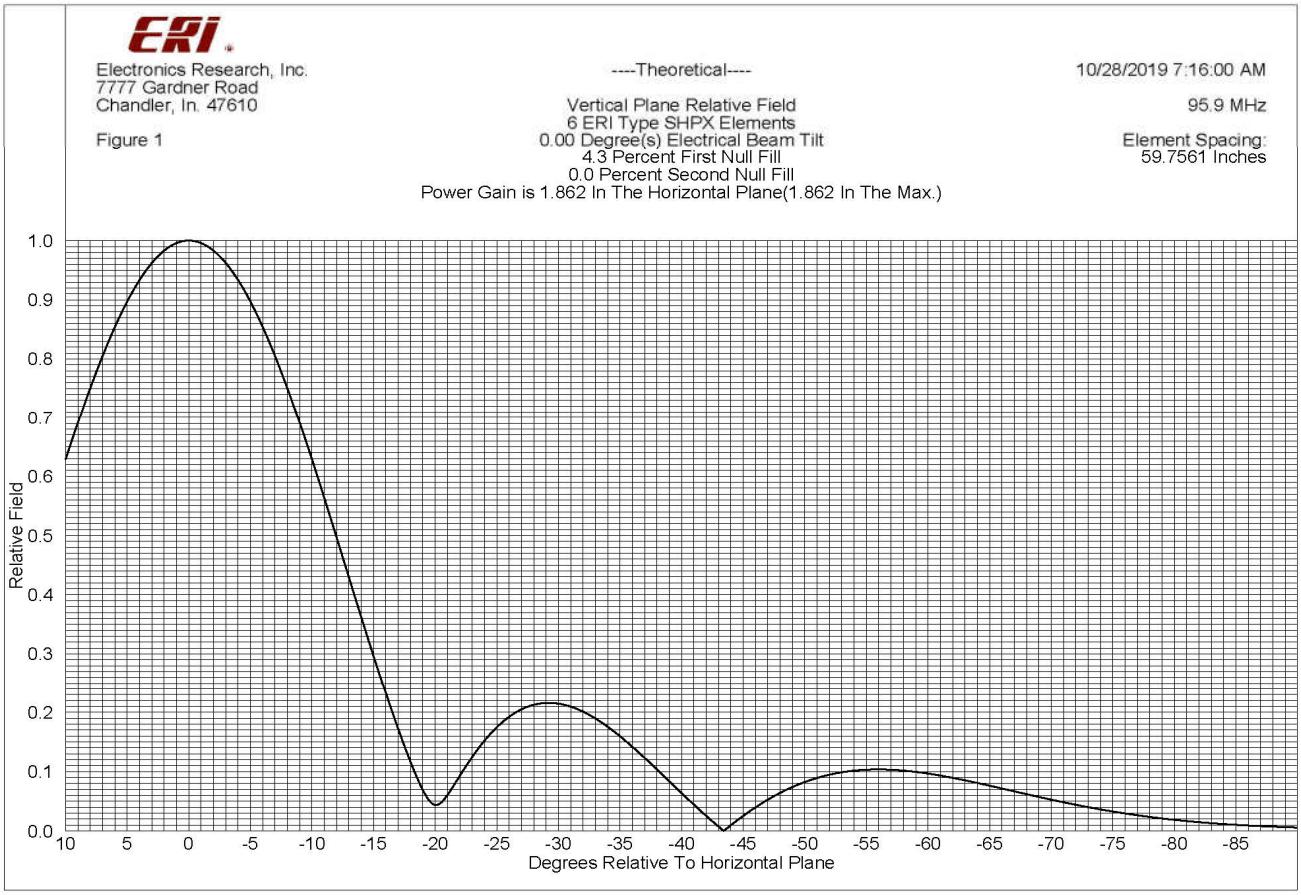

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 1
----Theoretical----
Vertical Plane Relative Field
6 ERI Type SHPX Elements
0.00 Degree(s) Electrical Beam Tilt
4.3 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 1.862 In The Horizontal Plane(1.862 In The Max.)
10/28/2019 7:16:00 AM
95.9 MHz
Element Spacing:
59.7561 Inches
Relative Field
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
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

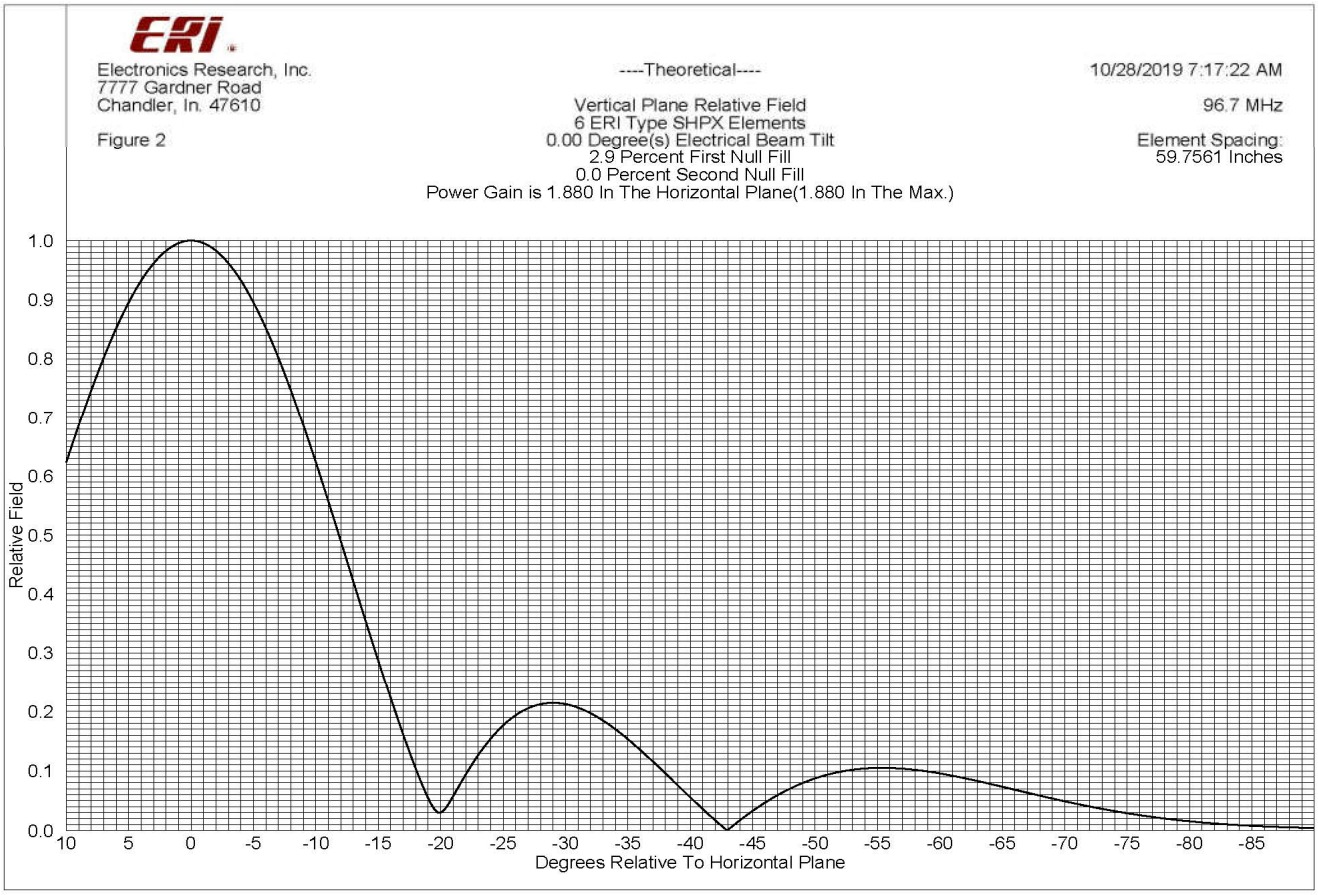

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 2
----Theoretical----
Vertical Plane Relative Field
6 ERI Type SHPX Elements
0.00 Degree(s) Electrical Beam Tilt
2.9 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 1.880 In The Horizontal Plane(1.880 In The Max.)
10/28/2019 7:17:22 AM
96.7 MHz
Element Spacing:
59.7561 Inches
Relative Field
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
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

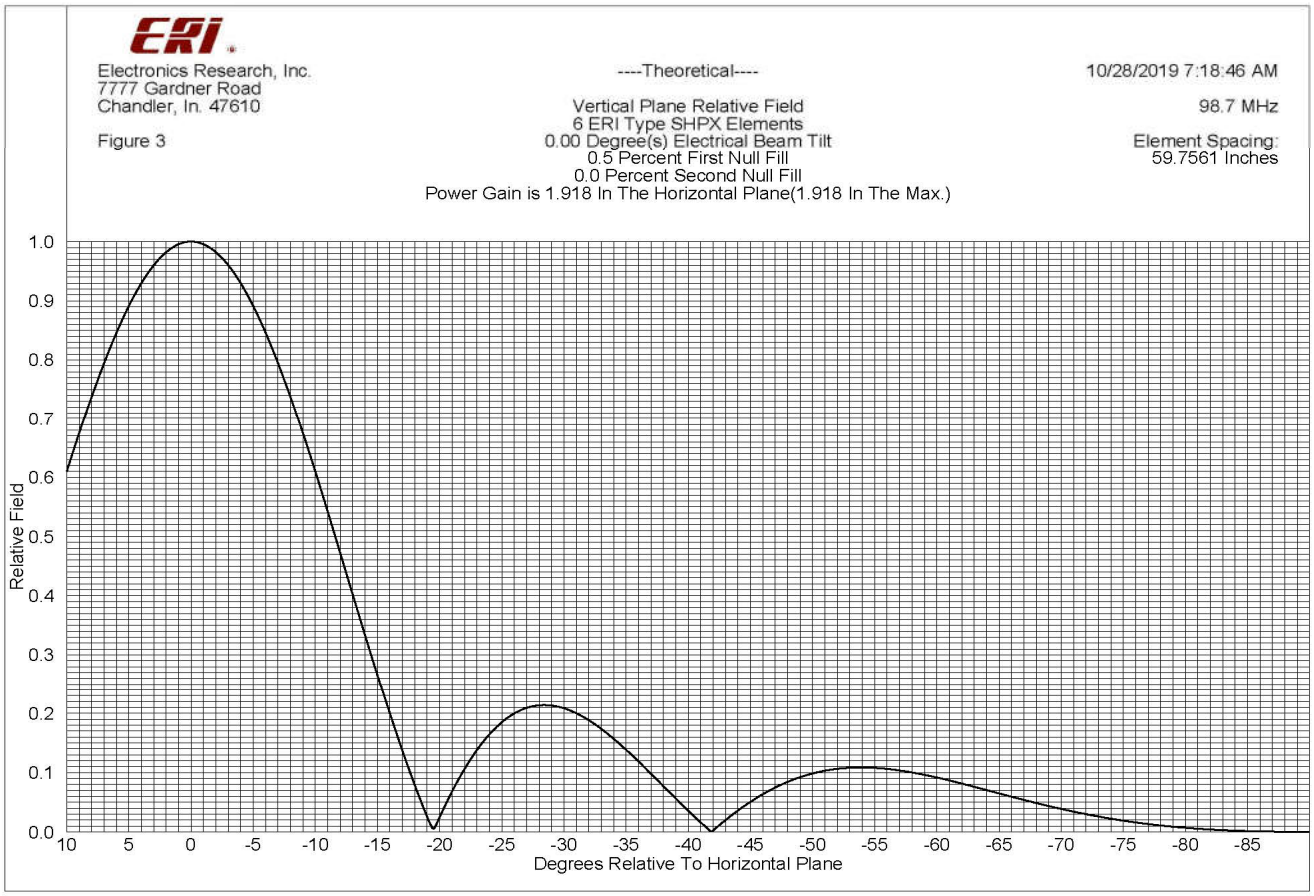
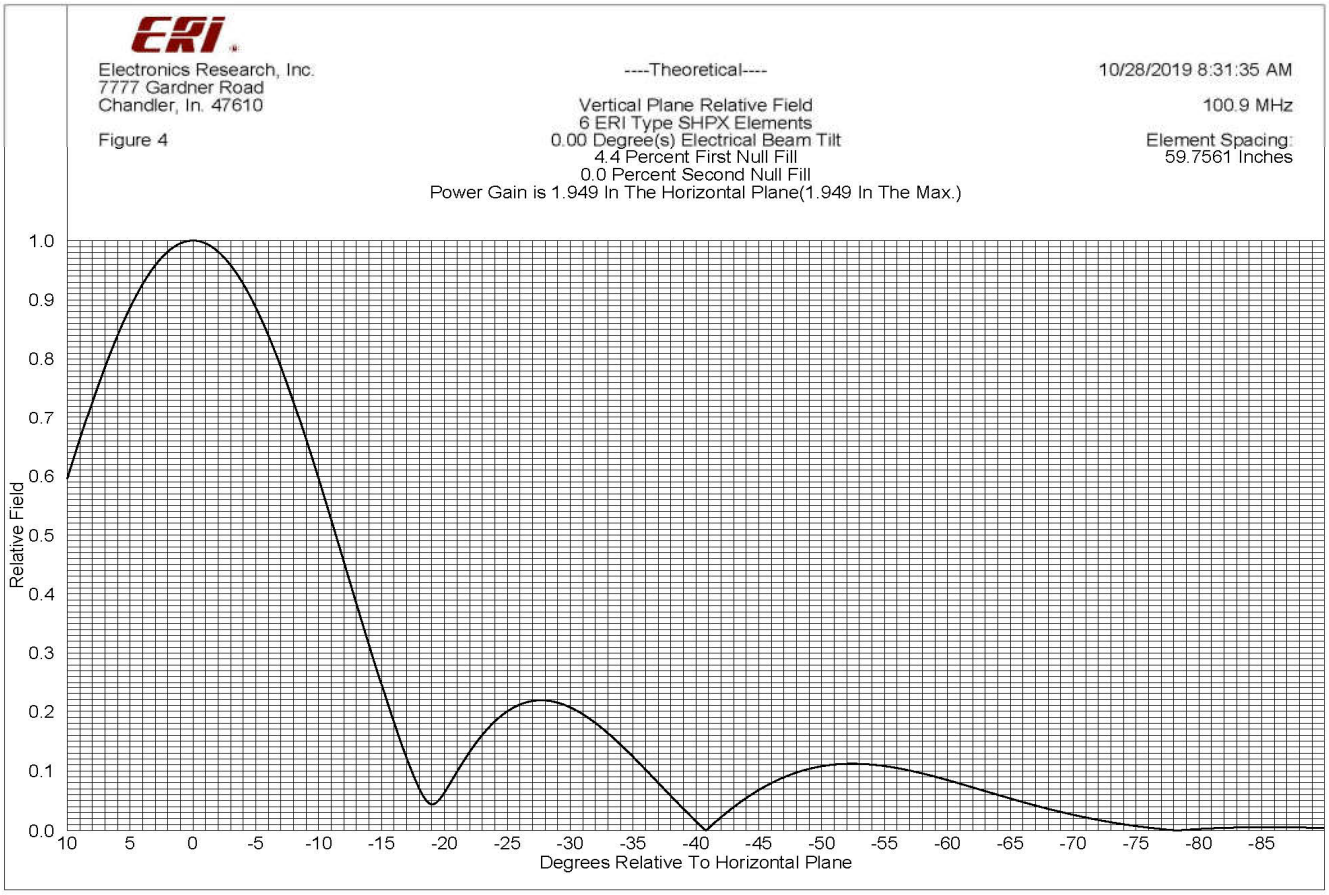
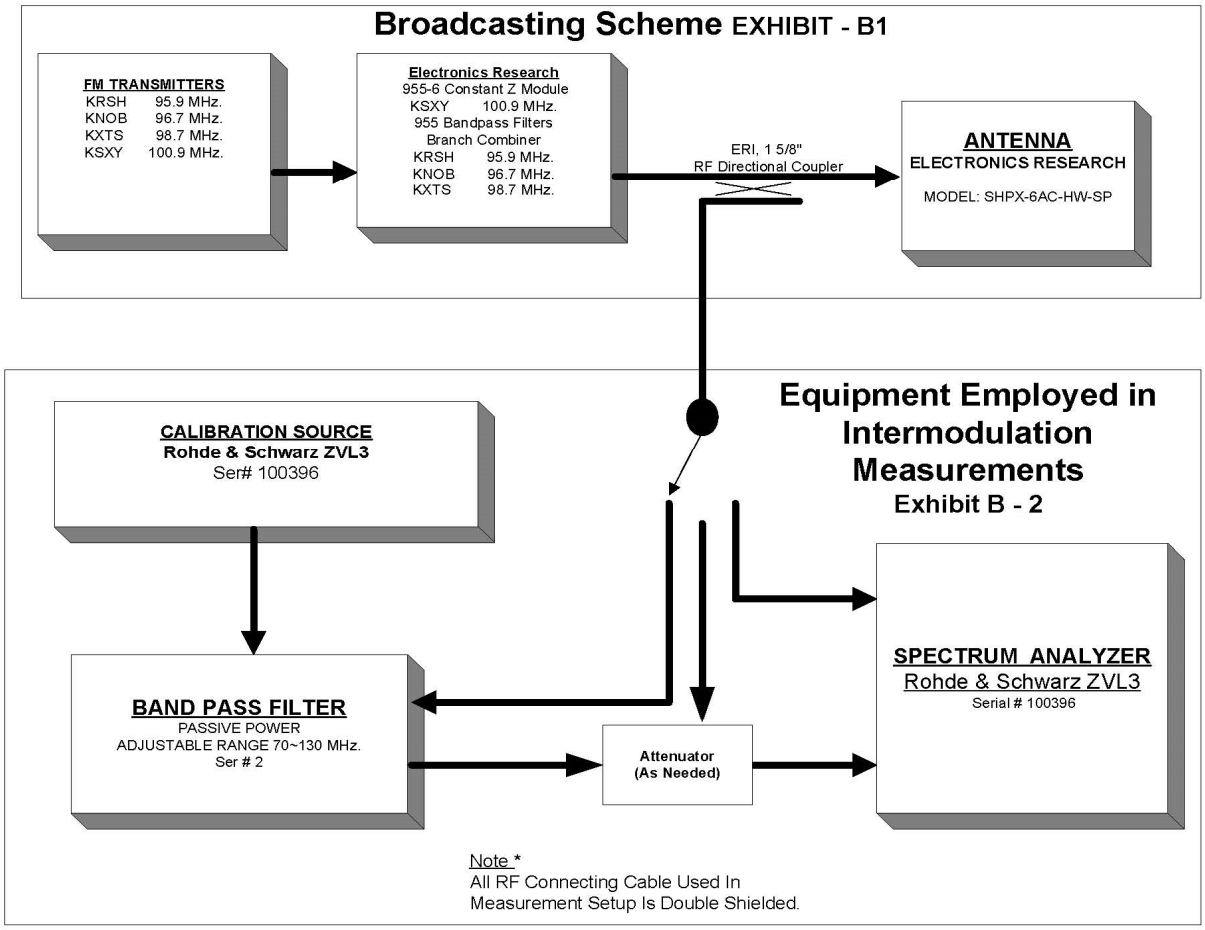

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 3
----Theoretical----
Vertical Plane Relative Field
6 ERI Type SHPX Elements
0.00 Degree(s) Electrical Beam Tilt
0.5 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 1.918 In The Horizontal Plane(1.918 In The Max.)
10/28/2019 7:18:46 AM
98.7 MHz
Element Spacing:
59.7561 Inches
Relative Field
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
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 4
----Theoretical----
Vertical Plane Relative Field
6 ERI Type SHPX Elements
0.00 Degree(s) Electrical Beam Tilt
4.4 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 1.949 In The Horizontal Plane(1.949 In The Max.)
10/28/2019 8:31:35 AM
100.9 MHz
Element Spacing:
59.7561 Inches
Relative Field
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
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