ELECTRONICS RESEARCH, INC. ERI

Report Of
Intermodulation Product Findings

Phoenix, AZ.

KYOT – 95.5 MHz.
KMXP – 96.9 MHz.
KESZ – 99.9 MHz.
KNIX-FM – 102.5 MHz.
KZZP – 104.7 MHz.

Project# 38738A

November 9, 2022

Electronics Research Inc.
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Chandler, Indiana 47610
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Report of Findings for Intermodulation Product Measurements

Exhibits Accompanying This Report

REPORT OF FINDINGS
PHOENIX, ARIZONA
BROADCAST FACILITY

Introduction: This report of findings is based on data collected at the FM broadcast facility located in Phoenix, AZ. The report includes measurements offered as proof that the combined operations of KYOT (95.5 MHz.), KMXP (96.9 MHz.), KESZ (99.9 MHz.), KNIX-FM (102.5 MHz.), and KZZP (104.7 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 9, 2022.

The following exhibits are provided:

Exhibit A:
- A-1 Drawing Depicting Axiom Antenna.
- A-2 SHPXA-16BC-HW-SP-2 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 five FM stations operating from their respective antenna system. The KYOT, KMXP, KESZ, KNIX-FM, and KZZP, multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The SHPXA-16BC-HW-SP-2 antenna, combiner units, and MACXLine 650 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 five transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of: (1) 783-8 Constant Impedance combiner module for each station was installed for frequency. Interconnecting "u-links" are required to complete the combiner which is illustrated in the attached Exhibit A-3. Note: At this time the combiner is designed to operate as a combined five station system into the 16-bay Axiom or into an upper or lower 8-bay axiom via the 7-port patch panel. The multiplexer, fully assembled, exhibited transmitter port-to-port isolation in excess of -70 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 -35 dB directivity and a forward signal sample of -52.1 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 ZPH Model .12 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
KYOT 95.5	**3**	**---**	**17.2**	**20.2**	
KMXP 96.9	**3**	**---**	**17.2**	**20.2**	
KESZ 99.9	**3**	**---**	**17.6**	**20.6**	
KNIX-FM 102.5	**3**	**---**	**17.8**	**20.8**	
KZZP 104.7	**3**	**---**	**17.6**	**20.6**	

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	**95.5**	**96.9**	**99.9**	**102.5**	**104.7**
95.5 MHz.	----	98.3	104.3	109.5	113.9
96.9 MHz.	94.1	----	102.9	108.1	112.5
99.9 MHz.	91.1	93.9	----	105.1	109.5
102.5 MHz.	88.5	91.3	97.3	----	106.9
104.7 MHz.	86.3	89.1	95.1	100.3	----

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 Phoenix, Arizona										
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										
	95.5	**Ref.**	3		3	17.2	20.2	**20.2**		
	96.9	**Ref.**	3		3	17.2	20.2	**20.2**		
	99.9	**Ref.**	3		3	17.6	20.6	**20.6**		
	102.5	**Ref.**	3		3	17.8	20.8	**20.8**		
	104.7	**Ref.**	3		3	17.6	20.6	**20.6**		
86.3	95.5	104.7	3	13.3	16.3	-112.9	-96.6	20.2	**-116.8**	
88.5	95.5	102.5	3	12.9	15.9	-113.8	-97.9	20.2	**-118.1**	
89.1	96.9	104.7	3	13.1	16.1	-114.1	-98	20.2	**-118.2**	
91.1	95.5	99.9	3	12.9	15.9	-113.2	-97.3	20.2	**-117.5**	
91.3	96.9	102.5	3	12.9	15.9	-113.5	-97.6	20.2	**-117.8**	
93.9	96.9	99.9	3	12.7	15.7	-114.2	-98.5	20.2	**-118.7**	
94.1	95.5	96.9	3	12.9	15.9	-112.9	-97	20.2	**-117.2**	
95.1	99.9	104.7	3	12.7	15.7	-104.6	-88.9	20.6	**-109.5**	
97.3	99.9	102.5	3	12.5	15.5	-105.1	-89.6	20.6	**-110.2**	
98.3	96.9	95.5	3	12.4	15.4	-113.4	-98	20.2	**-118.2**	
100.3	102.5	104.7	3	12.2	15.2	-102.3	-87.1	20.8	**-107.9**	
102.9	99.9	96.9	3	12.2	15.2	-105.1	-89.9	20.6	**-110.5**	
104.3	99.9	95.5	3	12.1	15.1	-97.6	-82.5	20.6	**-103.1**	
105.1	102.5	99.9	3	12.2	15.2	-100.2	-85	20.8	**-105.8**	
106.9	104.7	102.5	3	12.3	15.3	-107.4	-92.1	20.6	**-112.7**	
108.1	102.5	96.9	3	12.2	15.2	-113.9	-98.7	20.8	**-119.5**	
109.5	102.5	95.5	3	12.2	15.2	-112.9	-97.7	20.8	**-118.5**	
109.5	104.7	99.9	3	12.2	14.1	-112.9	-98.8	20.6	**-119.4**	
112.5	104.7	96.9	3	12.1	15.1	-113.7	-98.6	20.6	**-119.2**	
113.9	104.7	95.5	3	12.1	15.1	-113.9	-98.8	20.6	**-119.4**	

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 9, 2022 as summarized in this document, I, Jeff Taylor, find the subject system, specifically the transmitters and filter systems for the operation of KYOT, KMXP, KESZ, KNIX-FM, and KZZP, 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 KYOT, KMXP, KESZ, KNIX-FM, and KZZP, 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 26 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 IHM Licenses, LLC on behalf of radio Stations KYOT, KMXP, KESZ, KNIX-FM, and KZZP, in Phoenix, AZ. to prepare this Report of Findings.

Jeff Taylor; Field Technician

Jeff Taylor

Subscribed and sworn to before me on this 14th, day of November, 2022.

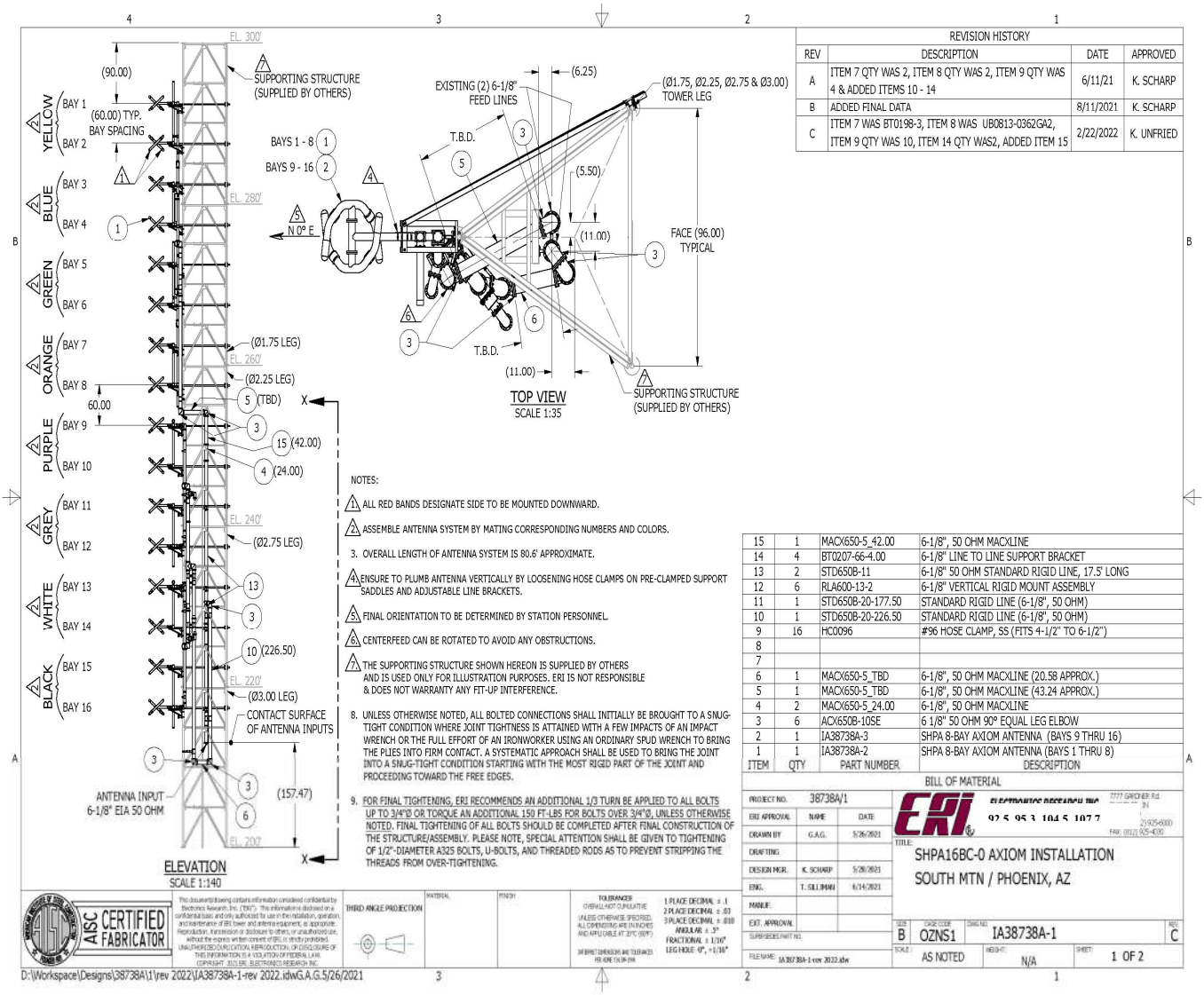
Cindy D Tomes; Notary Public
My commission expires September ~~30~~ 17, 2030

Cindy D Tomes

CINDY D TOMES
Notary Public, State of Indiana
Warrick County
Commission Number NP0658197
My Commission Expires
September 17, 2030

8

EXHIBIT, A-1



REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	ITEM 7 QTY WAS 2, ITEM 8 QTY WAS 2, ITEM 9 QTY WAS 4 & ADDED ITEMS 10 - 14	6/11/21	K. SCHARP
B	ADDED FINAL DATA	8/11/2021	K. SCHARP
C	ITEM 7 WAS BT0198-3, ITEM 8 WAS UB0813-0362GA2, ITEM 9 QTY WAS 10, ITEM 14 QTY WAS2, ADDED ITEM 15	2/22/2022	K. UNFRIED

NOTES:

1. ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD.
2. ASSEMBLE ANTENNA SYSTEM BY MATING CORRESPONDING NUMBERS AND COLORS.
3. OVERALL LENGTH OF ANTENNA SYSTEM IS 80.6' 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. THE SUPPORTING STRUCTURE SHOWN HEREON IS SUPPLIED BY OTHERS AND IS USED ONLY FOR ILLUSTRATION PURPOSES. ERI IS NOT RESPONSIBLE & DOES NOT WARRANTY ANY FIT-UP INTERFERENCE.
8. 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.
9. FOR FINAL TIGHTENING, ERI RECOMMENDS AN ADDITIONAL 1/3 TURN BE APPLIED TO ALL BOLTS UP TO 3/4"Ø OR TORQUE AN ADDITIONAL 150 FT-LBS FOR BOLTS OVER 3/4"Ø, 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
15	1	MACX650-5_42.00	6-1/8", 50 OHM MACXLINE
14	4	BT0207-66-4.00	6-1/8" LINE TO LINE SUPPORT BRACKET
13	2	STD650B-11	6-1/8" 50 OHM STANDARD RIGID LINE, 17.5' LONG
12	6	RLA600-13-2	6-1/8" VERTICAL RIGID MOUNT ASSEMBLY
11	1	STD650B-20-177.50	STANDARD RIGID LINE (6-1/8", 50 OHM)
10	1	STD650B-20-226.50	STANDARD RIGID LINE (6-1/8", 50 OHM)
9	16	HC0096	#96 HOSE CLAMP, SS (FITS 4-1/2" TO 6-1/2")
8			
7			
6	1	MACX650-5_TBD	6-1/8", 50 OHM MACXLINE (20.58 APPROX.)
5	1	MACX650-5_TBD	6-1/8", 50 OHM MACXLINE (43.24 APPROX.)
4	2	MACX650-5_24.00	6-1/8", 50 OHM MACXLINE
3	6	ACX650B-10SE	6 1/8" 50 OHM 90° EQUAL LEG ELBOW
2	1	IA38738A-3	SHPA 8-BAY AXIOM ANTENNA (BAYS 9 THRU 16)
1	1	IA38738A-2	SHPA 8-BAY AXIOM ANTENNA (BAYS 1 THRU 8)

BILL OF MATERIAL

PROJECT NO.	38738A/1	
ERI APPROVAL	NAME	DATE
DRAWN BY	G.A.G.	5/26/2021
DRAFTING		
DESIGN MGR.	K. SCHARP	5/26/2021
ENG.	T. SULLIMAN	6/14/2021
MANUF.		
EXT. APPROVAL		

SUPERSEDES PART NO.

FILE NAME: IA38738A-1-rev 2022.idw

TITLE: SHPA16BC-0 AXIOM INSTALLATION
SOUTH MTN / PHOENIX, AZ

SIZE: B | CAGE CODE: OZNS1 | DWG NO: IA38738A-1 | REV: C
SCALE: AS NOTED | WEIGHT: N/A | SHEET: 1 OF 2

AISC CERTIFIED FABRICATOR

THIRD ANGLE PROJECTION

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 ± .5°; FRACTIONAL ± 1/16"; LEG HOLE Ø", +1/16"

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A-2 ERI 1183 Antenna Specification Sheet

TRANSMISSION SITE
PHOENIX, ARIZONA

General Specifications

Antenna Type ……High Power FM-Broadcast, Suitable For Multiplexing
Model Number SHPXA-16BC-HW-SP-2
Number of Bay Levels .....Sixteen
Polarization..... Right Hand Circular Polarized

Electrical Specifications

Antenna Combined Input Power Capability ……..…….. 116 kW Max (1)
Operating Frequency Band ..... 95.5 ~ 104.7 Megahertz.
CombinedVSWR …… <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:

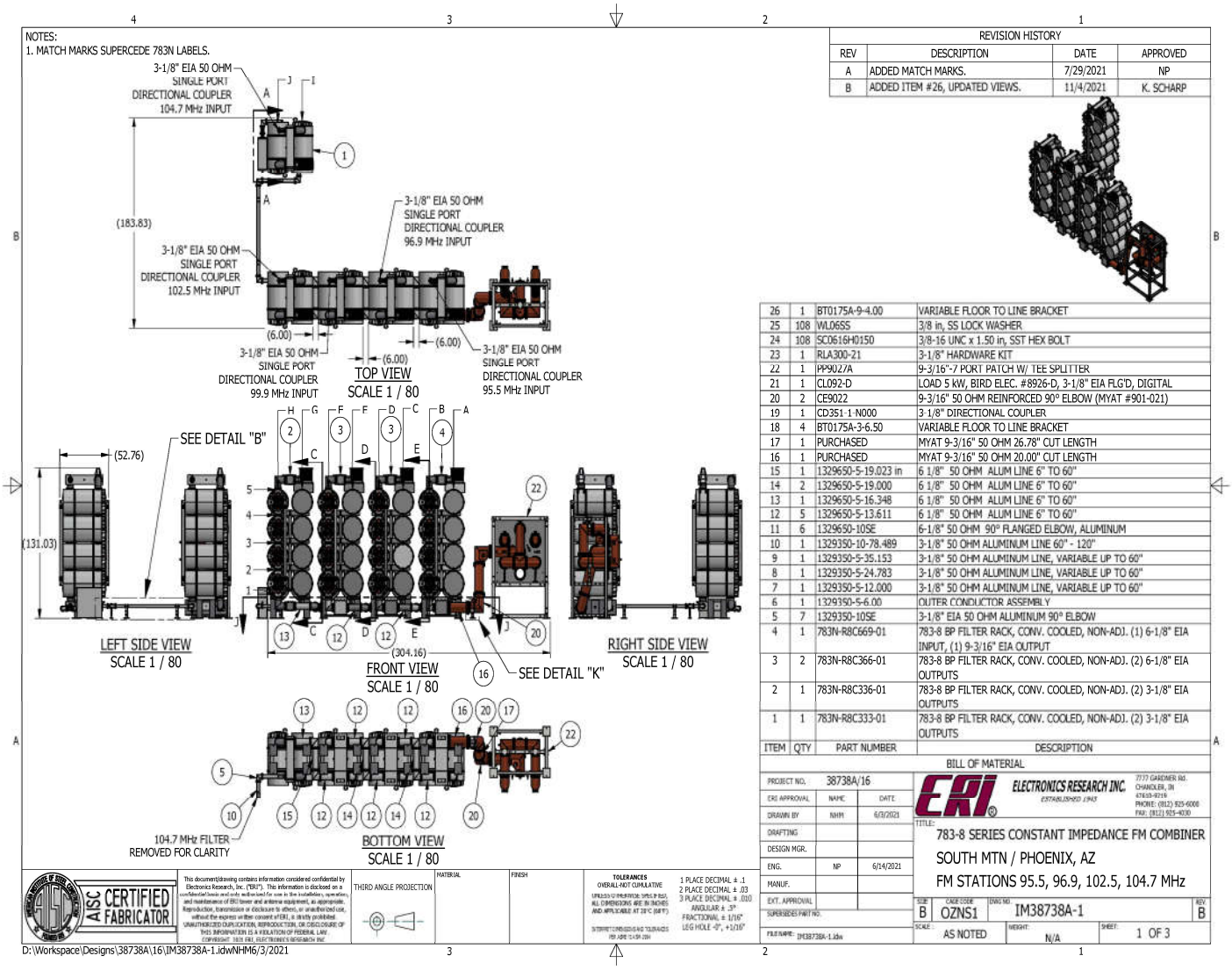
Frequency	Station ERP	Beam Tilt	First Null Fill	Second Null Fill	Power Gain	Line Loss (3)	Filter Loss (4)	Computed TPO
95.5	**100 kW**	**-0.75°**	**10.0 %**	**0.0 %**	**4.622**	**-0.164 dB**	**-0.250 dB**	**23.86 kW**
96.9	**100 kW**	**-0.75°**	**10.0 %**	**0.0 %**	**4.690**	**-0.162 dB**	**-0.277 dB**	**23.68 kW**
99.9	**100 kW**	**-0.75°**	**10.0 %**	**0.0 %**	**4.824**	**-0.175 dB**	**-0.286 dB**	**23.10 kW**
102.5	**100 kW**	**-0.75°**	**10.0 %**	**0.0 %**	**4.926**	**-0.170 dB**	**-0.314 dB**	**22.75 kW**
104.7	**100 kW**	**-0.75°**	**10.0 %**	**0.0 %**	**5.001**	**-0.183 dB**	**-0.347 dB**	**22.60 kW**

Mechanical Specifications

Antenna Feed System..... Fed with Two Lines
Input Connector …….. 6 1/8 ”50-Ohm EIA Flanged
Element Deicing .....None
Interbay Spacing..... 60” Center to Center
Array Length ..... 88.5 Feet
Construction Material (Antenna)..... Brass, Copper, 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 269 Feet of ERI MACXLine 6 1/8” Rigid 17.5 Foot Sticks. (Two Runs)
4) Losses Taken from Actual Combiner.

EXHIBIT A-3



ITEM	QTY	PART NUMBER	DESCRIPTION
26	1	BT0175A-9-4.00	VARIABLE FLOOR TO LINE BRACKET
25	108	WL06SS	3/8 in, SS LOCK WASHER
24	108	SC0616H0150	3/8-16 UNC x 1.50 in, SST HEX BOLT
23	1	RLA300-21	3-1/8" HARDWARE KIT
22	1	PP9027A	9-3/16"-7 PORT PATCH W/ TEE SPLITTER
21	1	CL092-D	LOAD 5 kW, BIRD ELEC. #8926-D, 3-1/8" EIA FLG'D, DIGITAL
20	2	CE9022	9-3/16" 50 OHM REINFORCED 90° ELBOW (MYAT #901-021)
19	1	CD351-1-N000	3-1/8" DIRECTIONAL COUPLER
18	4	BT0175A-3-6.50	VARIABLE FLOOR TO LINE BRACKET
17	1	PURCHASED	MYAT 9-3/16" 50 OHM 26.78" CUT LENGTH
16	1	PURCHASED	MYAT 9-3/16" 50 OHM 20.00" CUT LENGTH
15	1	1329650-5-19.023 in	6 1/8" 50 OHM ALUM LINE 6" TO 60"
14	2	1329650-5-19.000	6 1/8" 50 OHM ALUM LINE 6" TO 60"
13	1	1329650-5-16.348	6 1/8" 50 OHM ALUM LINE 6" TO 60"
12	5	1329650-5-13.611	6 1/8" 50 OHM ALUM LINE 6" TO 60"
11	6	1329650-10SE	6-1/8" 50 OHM 90° FLANGED ELBOW, ALUMINUM
10	1	1329350-10-78.489	3-1/8" 50 OHM ALUMINUM LINE 60" - 120"
9	1	1329350-5-35.153	3-1/8" 50 OHM ALUMINUM LINE, VARIABLE UP TO 60"
8	1	1329350-5-24.783	3-1/8" 50 OHM ALUMINUM LINE, VARIABLE UP TO 60"
7	1	1329350-5-12.000	3-1/8" 50 OHM ALUMINUM LINE, VARIABLE UP TO 60"
6	1	1329350-5-6.00	OUTER CONDUCTOR ASSEMBLY
5	7	1329350-10SE	3-1/8" EIA 50 OHM ALUMINUM 90° ELBOW
4	1	783N-R8C669-01	783-8 BP FILTER RACK, CONV. COOLED, NON-ADJ. (1) 6-1/8" EIA INPUT, (1) 9-3/16" EIA OUTPUT
3	2	783N-R8C366-01	783-8 BP FILTER RACK, CONV. COOLED, NON-ADJ. (2) 6-1/8" EIA OUTPUTS
2	1	783N-R8C336-01	783-8 BP FILTER RACK, CONV. COOLED, NON-ADJ. (2) 3-1/8" EIA OUTPUTS
1	1	783N-R8C333-01	783-8 BP FILTER RACK, CONV. COOLED, NON-ADJ. (2) 3-1/8" EIA OUTPUTS

BILL OF MATERIAL

PROJECT NO. 38738A/16

	NAME	DATE
ERI APPROVAL		
DRAWN BY	NHM	6/3/2021
DRAFTING		
DESIGN MGR.		
ENG.	NP	6/14/2021
MANUF.		
EXT. APPROVAL		

SUPERSEDES PART NO:
FILE NAME: IM38738A-1.idw

ELECTRONICS RESEARCH INC.
7777 GARDNER Rd.
CHANDLER, IN
47610-9219
PHONE: (812) 925-6000
FAX: (812) 925-4030

TITLE:
783-8 SERIES CONSTANT IMPEDANCE FM COMBINER
SOUTH MTN / PHOENIX, AZ
FM STATIONS 95.5, 96.9, 102.5, 104.7 MHz

SIZE B | CAGE CODE OZNS1 | DWG NO IM38738A-1 | REV B
SCALE: AS NOTED | WEIGHT: N/A | SHEET: 1 OF 3

AISC 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)
INTERPRETDIMENSIONING TOLERANCES PER ASME Y14.5M-1994
1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR: ± .5°
FRACTIONAL ± 1/16"
LEG HOLE +0", +1/16"

D:\Workspace\Designs\38738A\16\IM38738A-1.idwNHM6/3/2021

A-4 ERI Combiner Specification Sheet

TRANSMISSION SITE
PHOENIX, ARIZONA

General Specifications:

Multiplexer Type .....Constant Impedance Combiner
Number of Combining Units ..... Five
Injected Port to Injected Port Isolation ..... < - 70 dB
Output Connector ..... 9 3/16 "50 Ohm EIA (Flanged)
Output Power (Designed) ..... 116 kW(1)

Heat Removal .....Natural Convection Cooling
Physical Arrangement ..... Rack Mounted

Injected Port Specifications:

Frequency Assignment .....95.5 ~ 96.9 ~ 99.9 ~ 102.5 ~ 104.7 MHz.
Power Rating, Each Injected Port (Designed).....23.8 kW 95.5 MHz, 23.6 kW 96.9 MHz.
Power Rating, Each Injected Port (Designed).....23.1 kW 99.9 MHz, 22.7 kW 102.5 MHz.
Power Rating, Each Injected Port (Designed).....22.6 kW 104.7 MHz.
Input Connector .....3-1/8" 50 Ohm EIA (Flanged)
VSWR.....< 1.06:1 @ +/-200 KHz.(2)
Group Delay .....Less than 150 ns Overall Variation, Carrier @ +/- 150 KHz.
Insertion Loss (Measured):

95.5 MHz. ..... - 0.250 dB
96.9 MHz. ..... - 0.277 dB
99.9 MHz. ..... - 0.286 dB
102.5 MHz. ..... - 0.314 dB
104.7 MHz. ..... - 0.347 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

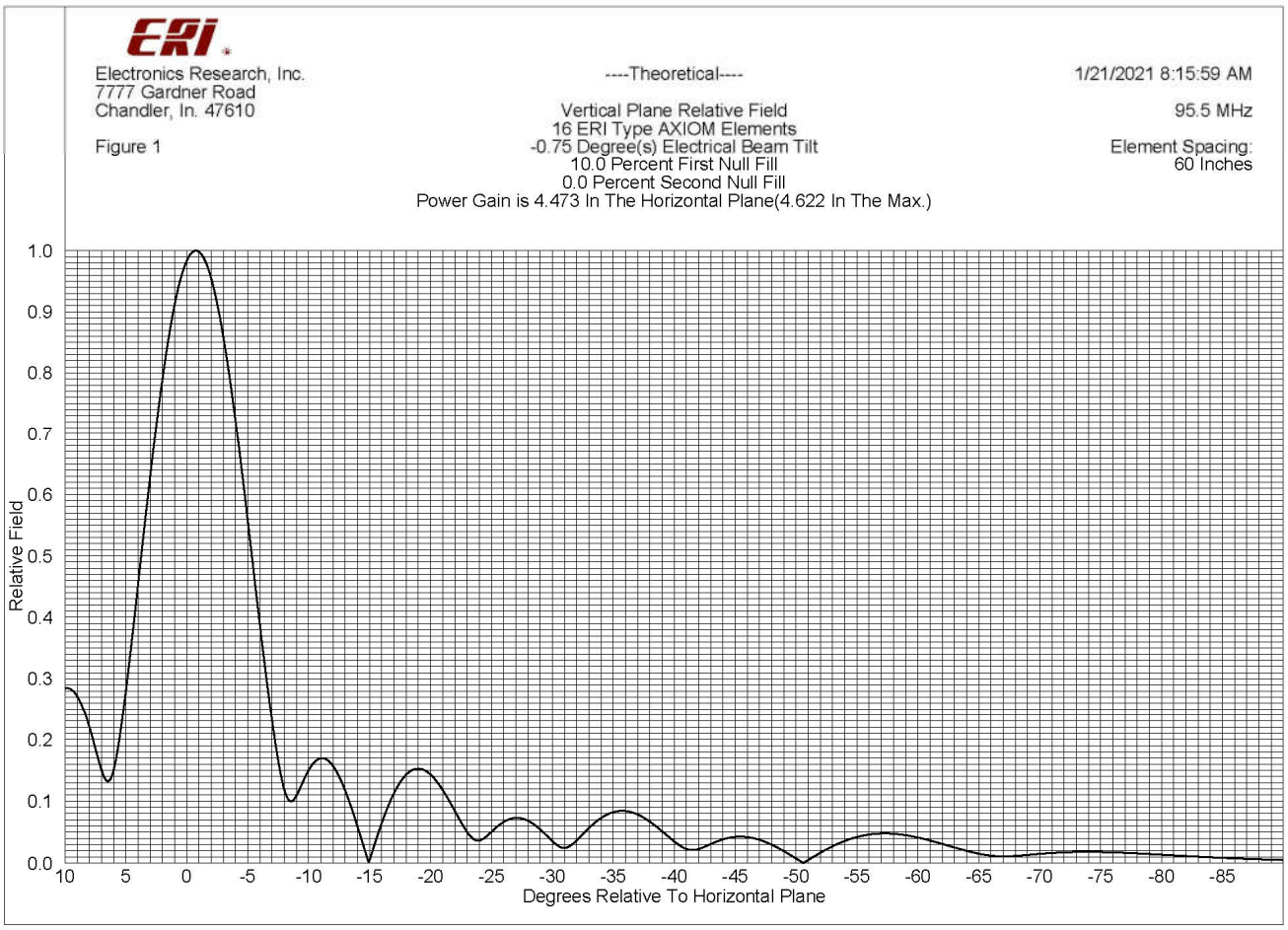

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 1
----Theoretical----
Vertical Plane Relative Field
16 ERI Type AXIOM Elements
-0.75 Degree(s) Electrical Beam Tilt
10.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.473 In The Horizontal Plane(4.622 In The Max.)
1/21/2021 8:15:59 AM
95.5 MHz
Element Spacing:
60 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

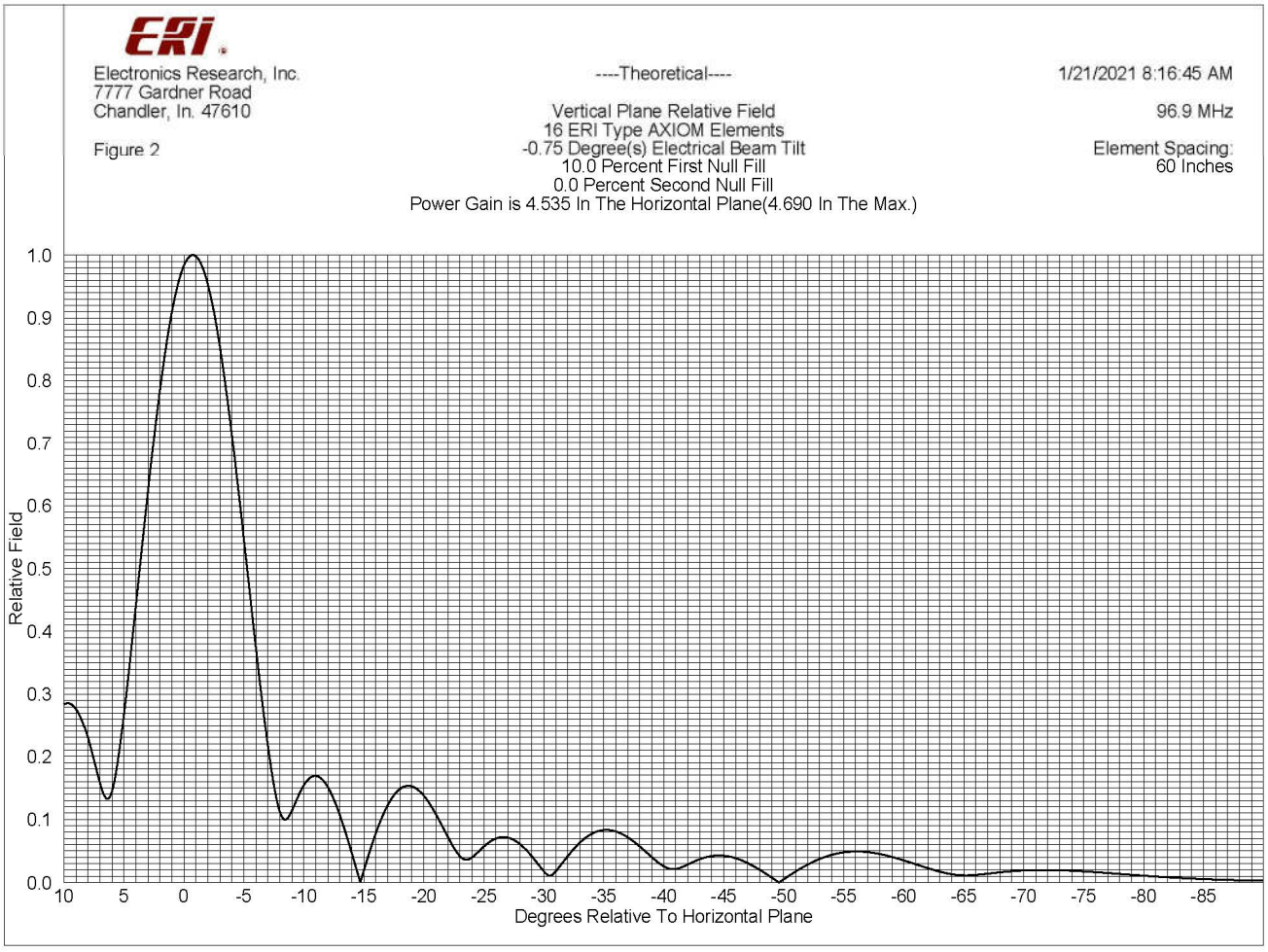
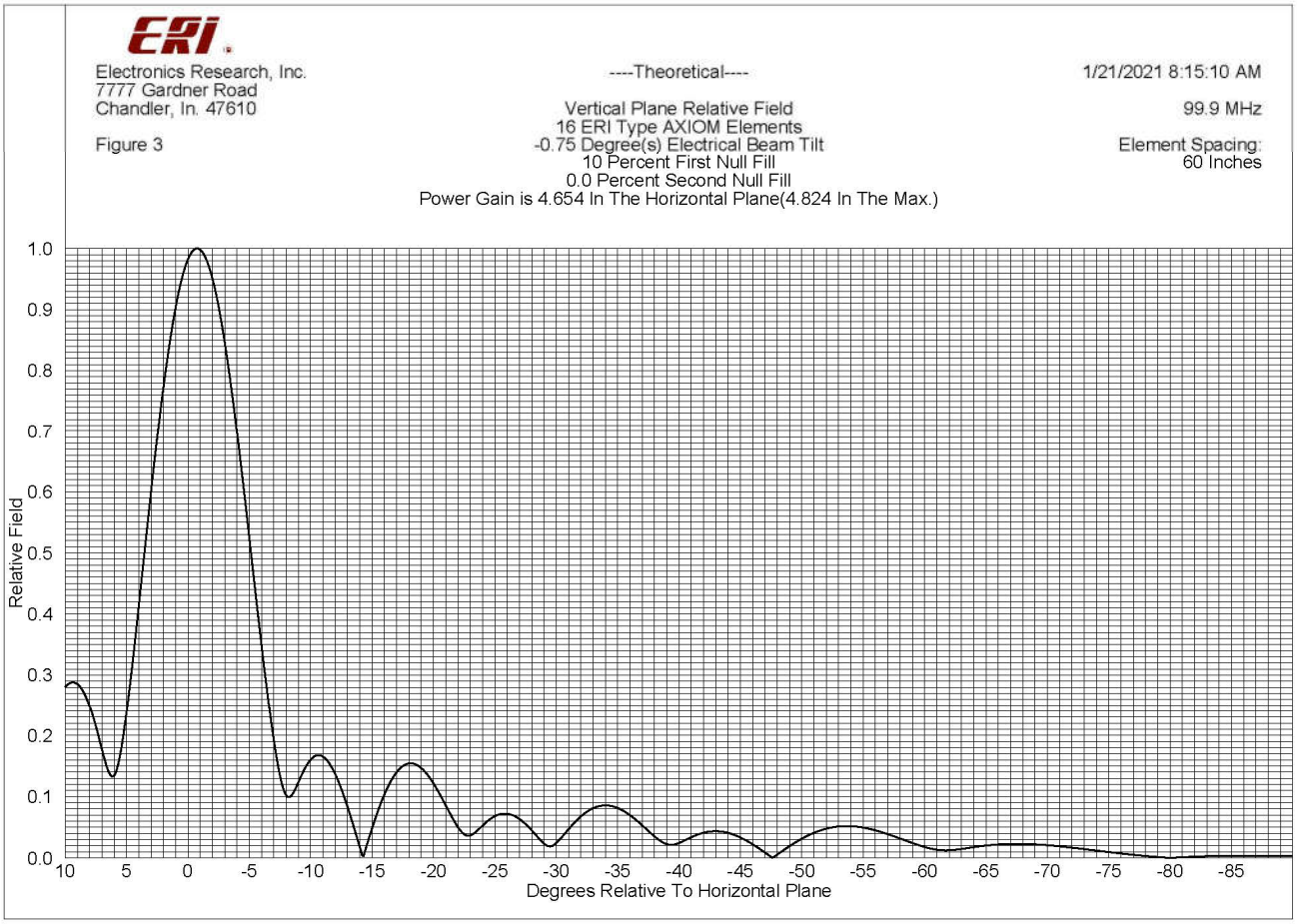

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 2
----Theoretical----
Vertical Plane Relative Field
16 ERI Type AXIOM Elements
-0.75 Degree(s) Electrical Beam Tilt
10.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.535 In The Horizontal Plane(4.690 In The Max.)
1/21/2021 8:16:45 AM
96.9 MHz
Element Spacing:
60 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
16 ERI Type AXIOM Elements
-0.75 Degree(s) Electrical Beam Tilt
10 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.654 In The Horizontal Plane(4.824 In The Max.)
1/21/2021 8:15:10 AM
99.9 MHz
Element Spacing:
60 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

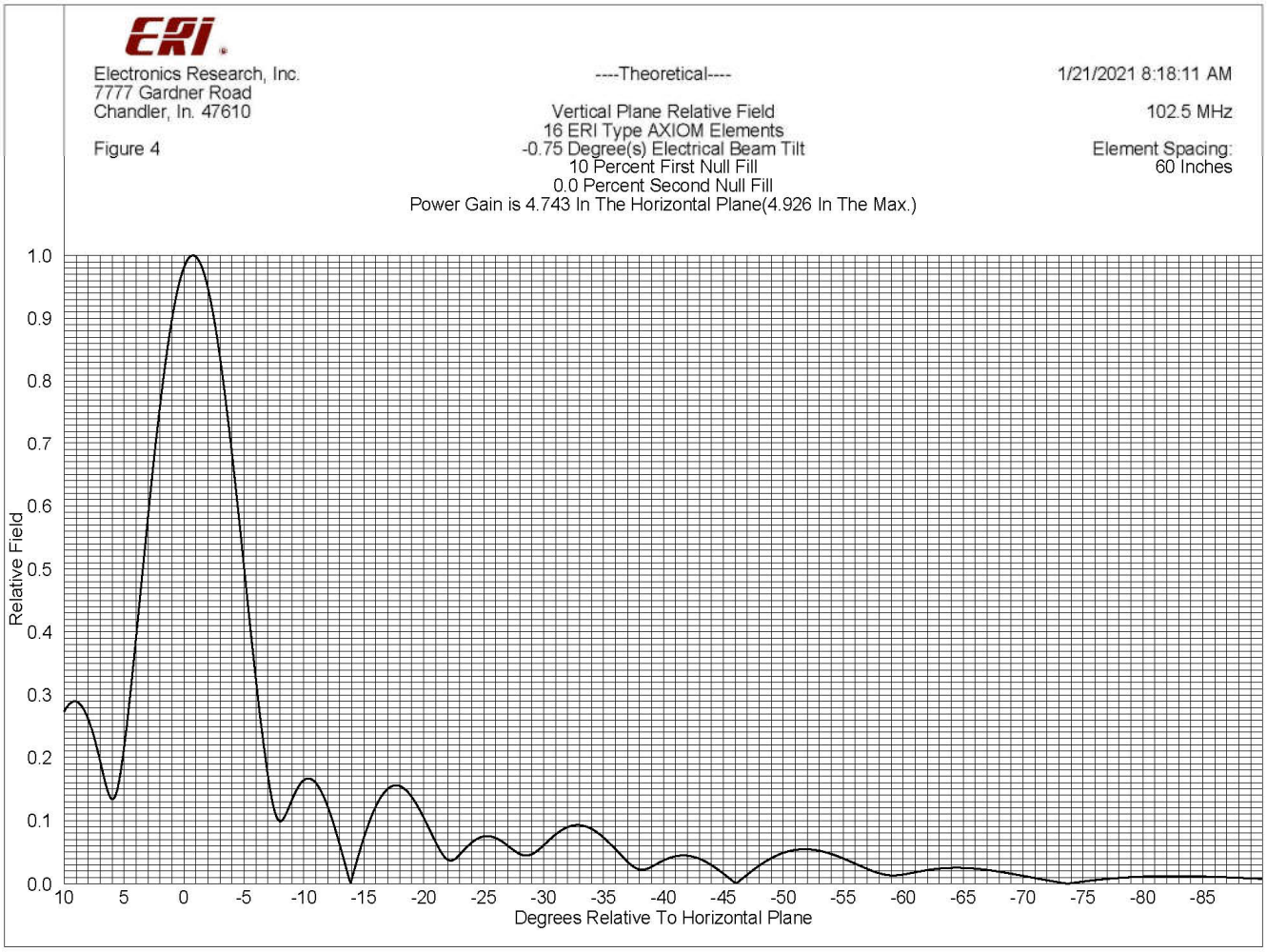

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 4
----Theoretical----
Vertical Plane Relative Field
16 ERI Type AXIOM Elements
-0.75 Degree(s) Electrical Beam Tilt
10 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.743 In The Horizontal Plane(4.926 In The Max.)
1/21/2021 8:18:11 AM
102.5 MHz
Element Spacing:
60 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

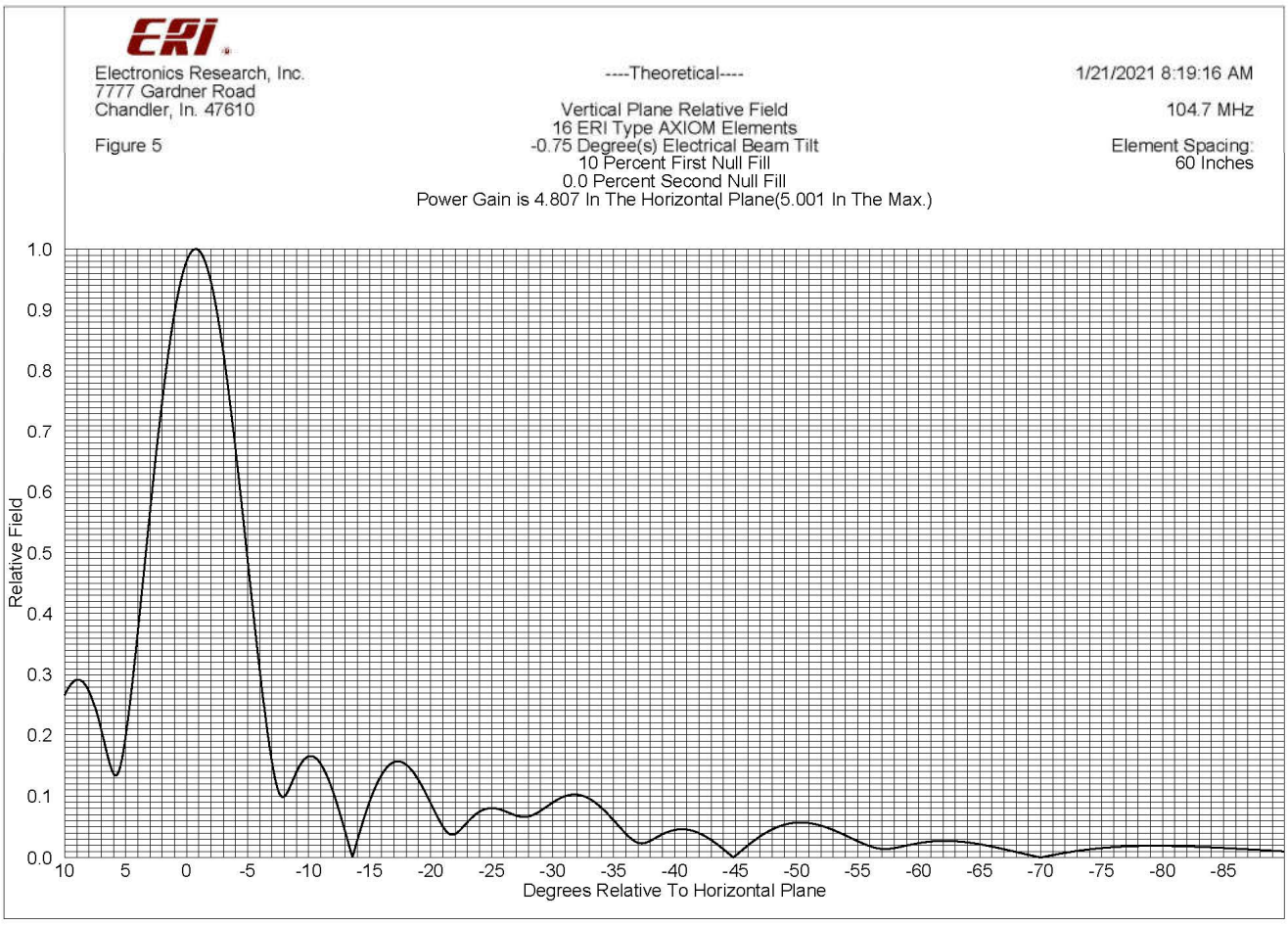
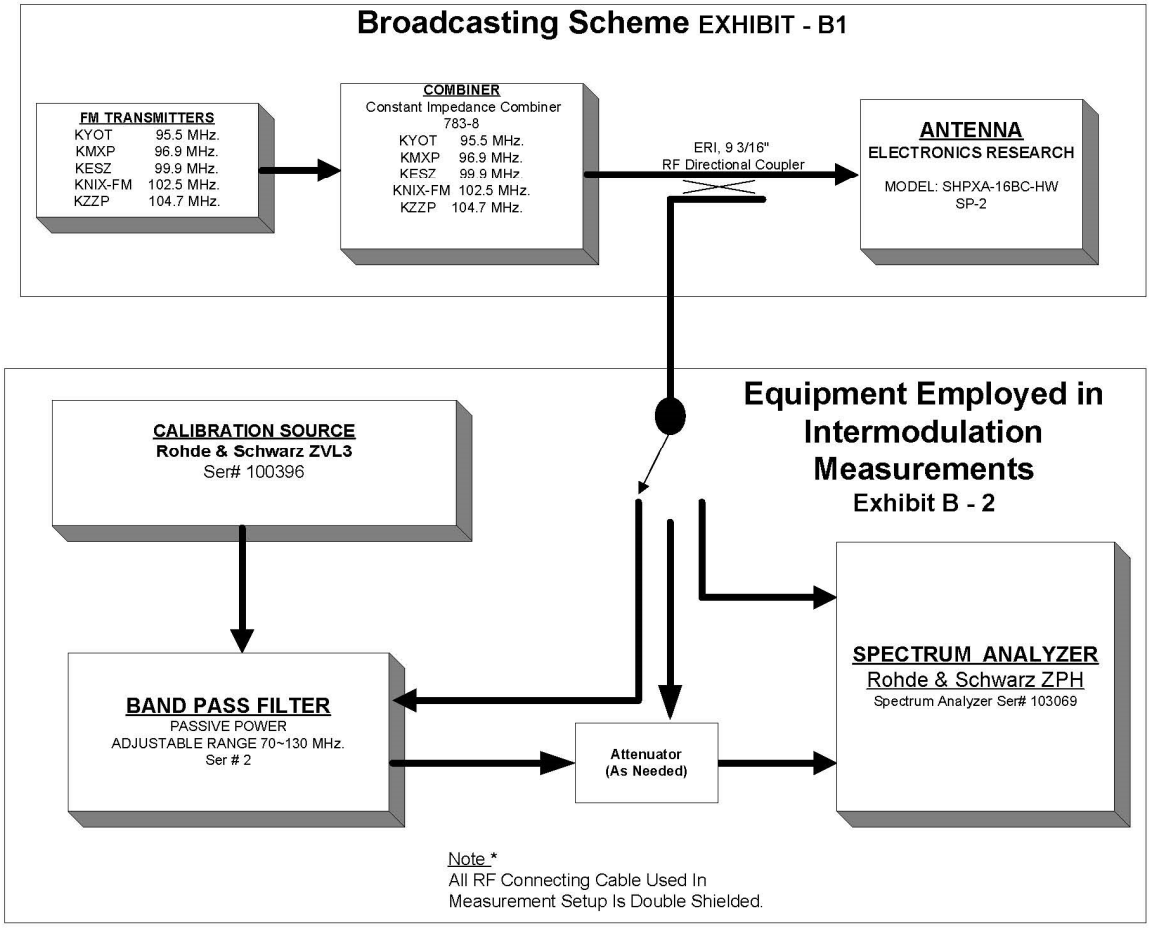

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 5
----Theoretical----
Vertical Plane Relative Field
16 ERI Type AXIOM Elements
-0.75 Degree(s) Electrical Beam Tilt
10 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.807 In The Horizontal Plane(5.001 In The Max.)
1/21/2021 8:19:16 AM
104.7 MHz
Element Spacing:
60 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 B – 1



Broadcasting Scheme and Equipment Employed in Intermodulation Measurements

EXHIBIT B