Report Of Intermodulation Product Findings

FAIRBANKS, ALASKA

KWDD – 94.3 MHz.
KXLR – 95.9 MHz.
KWLF – 98.1 MHz.
KTDZ – 103.9 MHz.

Project# 30074

October 26, 2012

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

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REPORT OF FINDINGS
BOSOTON, MASSACHUSETTS BROADCAST FACILITY
NEEDHAM, MASSACHUSETTS

Introduction: This report of findings is based on data collected at the FM broadcast facility located in Fairbanks, AK. The report includes measurements offered as proof that the combined operations of KWDD (94.3 MHz.), KXLR (95.9 MHz.), KWLF (98.1 MHz.), and KTDZ (103.9 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 October 26, 2012.

The following exhibits are provided:

Exhibit A:
- A-1 Drawing Depicting Antenna.
- A-2 SHPXA-8AC-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 combined antenna system. The KWDD, KXLR, KWLF, and KTDZ multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The SHPXA-8AC-SP (antenna), 955 Constant Impedance combiner units, and 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 955 Constant Impedance Combiner, filter system was installed. Specifically, the combiner utilizes one ERI Model 955 module for each frequency (94.3 MHz., 95.9 MHz., 98.1 MHz., and 103.9 MHz.). An interconnecting "u-link" is 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 -77 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 -54 dB directivity and a forward signal sample of -30 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 ZVL Vector Network Analyzer with Spectrum Analyzer serial# 100396 was employed to record the level of all signals investigated. The Rohde & Schwarz was also used for selective tuning of the Band Pass Filter. The Spectrum Analyzer portion of the Rohde & Schwarz 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 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)	Bandpass Filter Loss (dB)	Measured Level (dBm)	**Adjusted Level (dBm)**	Notes
94.3	**6**	**-**	**6.23**	**12.23**	
95.9	**6**	**-**	**5.92**	**11.92**	
98.1	**6**	**-**	**6.54**	**12.54**	
103.9	**6**	**-**	**7.46**	**13.46**	

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	**94.3**	**95.9**	**98.1**	**103.9**
KWDD 94.3 MHz.	----	97.5	101.9	113.5
KXLR 95.9 MHz.	92.7	----	100.3	111.9
KWLF 98.1 MHz.	90.5	93.7	----	109.7
KTDZ 103.9 MHz.	84.7	87.9	92.3	----

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										
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										
	94.3		6		6	6.23	12.23	**12.23**		
	95.9		6		6	5.92	11.92	**11.92**		
	98.1		6		6	6.54	12.54	**12.54**		
	103.9		6		6	7.46	13.46	**13.46**		
84.7	94.3	103.9	6	10.62	16.62	-85.42	-68.8	12.23	**-81.03**	
87.9	95.9	103.9	6	10.61	16.61	-85.92	-69.31	11.92	**-81.23**	
90.5	94.3	98.1	6	10.59	16.59	-86.65	-70.06	12.23	**-82.29**	
92.3	98.1	103.9	6	10.63	16.63	-84.35	-67.72	12.54	**-80.26**	
92.7	94.3	95.9	6	10.58	16.58	-85.32	-68.74	12.23	**-80.97**	
93.7	95.9	98.1	6	10.61	16.61	-86.36	-69.75	11.92	**-81.67**	
97.5	95.9	94.3	6	10.53	16.53	-86.44	-69.91	11.92	**-81.83**	
100.3	98.1	95.9	6	10.62	16.62	-86.04	-69.42	12.54	**-81.96**	
101.9	98.1	94.3	6	10.68	16.68	-87.18	-70.5	12.54	**-83.04**	
109.7	103.9	98.1	6	10.58	16.58	-84.63	-68.05	13.46	**-81.51**	
111.9	103.9	95.9	6	10.56	16.56	-85.45	-68.89	13.46	**-82.35**	
113.5	103.9	94.3	6	10.52	16.52	-85.59	-69.07	13.46	**-82.53**	

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 October 26, 2012 as summarized in this document, I, Jeff Taylor, find the subject system, specifically the transmitter and filter system for the operation of KWDD, KXLR, KWLF, and KTDZ 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 KWDD, KXLR, KWLF, and KTDZ 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 15 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 Last Frontier Mediactive on behalf of radio Stations KWDD, KXLR, KWLF and KTDZ in Fairbanks, AK. to prepare this Report Of Findings.

Jeff Taylor; Field Technician

Jeff Taylor

Subscribed and sworn to before me on this 30th, day of October, 2012.

Jacquelyn Kinney; Notary Public
My commission expires July 5, 2015

JACQUELYN S. KINNEY
Notary Public, State of Indiana
Vanderburgh County
My Commission Expires
July 05, 2015

Jacquelyn S. Kinney

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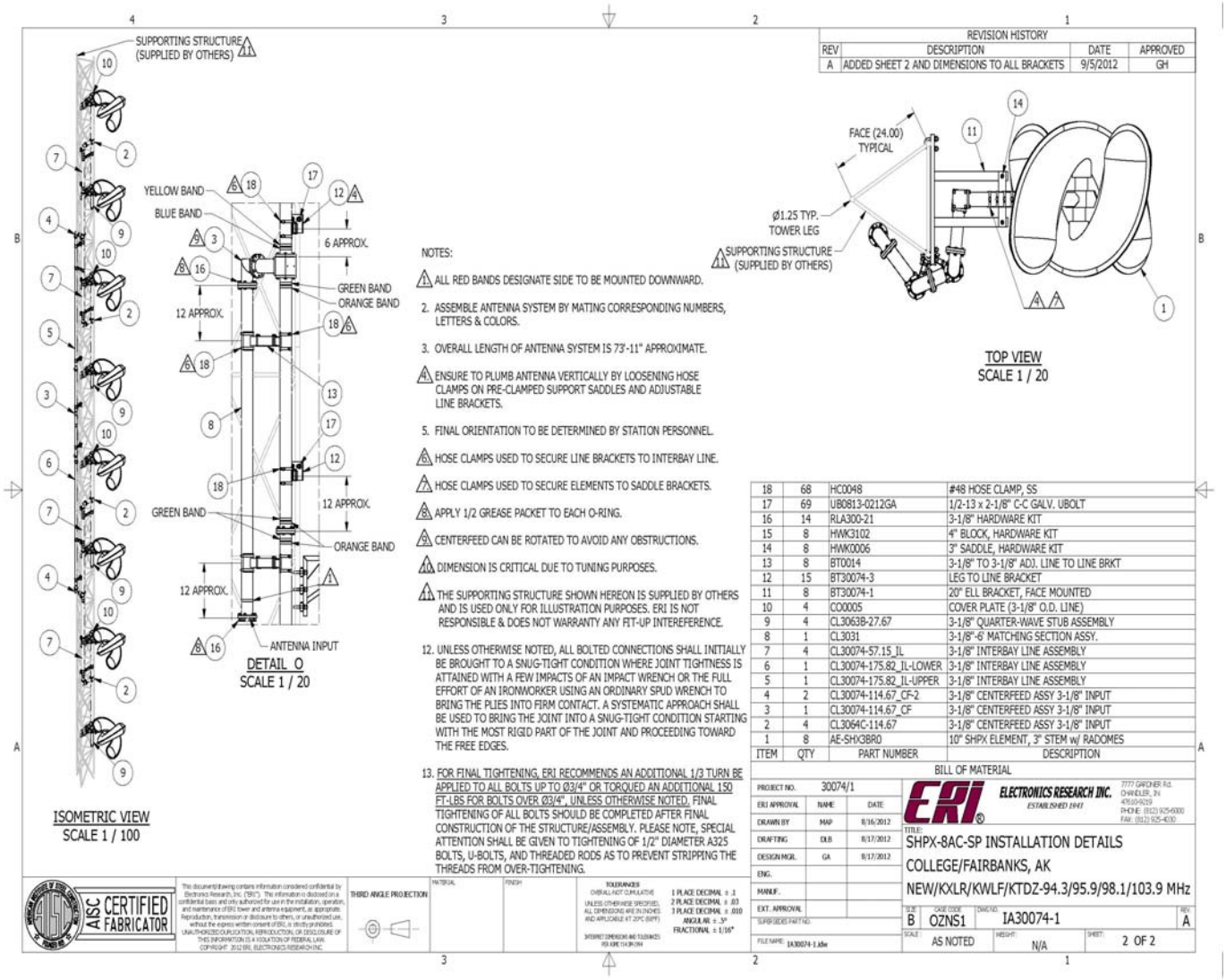
EXHIBIT, A-1



REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	ADDED SHEET 2 AND DIMENSIONS TO ALL BRACKETS	9/5/2012	GH

NOTES:

1. ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD.
2. ASSEMBLE ANTENNA SYSTEM BY MATING CORRESPONDING NUMBERS, LETTERS & COLORS.
3. OVERALL LENGTH OF ANTENNA SYSTEM IS 73'-11" 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. HOSE CLAMPS USED TO SECURE LINE BRACKETS TO INTERBAY LINE.
7. HOSE CLAMPS USED TO SECURE ELEMENTS TO SADDLE BRACKETS.
8. APPLY 1/2 GREASE PACKET TO EACH O-RING.
9. CENTERFEED CAN BE ROTATED TO AVOID ANY OBSTRUCTIONS.
10. DIMENSION IS CRITICAL DUE TO TUNING PURPOSES.
11. 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 INTEREFERENCE.
12. 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.
13. FOR FINAL TIGHTENING, ERI RECOMMENDS AN ADDITIONAL 1/3 TURN BE APPLIED TO ALL BOLTS UP TO Ø3/4" OR TORQUED 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
18	68	HC0048	#48 HOSE CLAMP, SS
17	69	UB0813-0212GA	1/2-13 x 2-1/8" C-C GALV. UBOLT
16	14	RLA300-21	3-1/8" HARDWARE KIT
15	8	HWK3102	4" BLOCK, HARDWARE KIT
14	8	HWK0006	3" SADDLE, HARDWARE KIT
13	8	BT0014	3-1/8" TO 3-1/8" ADJ. LINE TO LINE BRKT
12	15	BT30074-3	LEG TO LINE BRACKET
11	8	BT30074-1	20" ELL BRACKET, FACE MOUNTED
10	4	CO0005	COVER PLATE (3-1/8" O.D. LINE)
9	4	CL3063B-27.67	3-1/8" QUARTER-WAVE STUB ASSEMBLY
8	1	CL3031	3-1/8"-6' MATCHING SECTION ASSY.
7	4	CL30074-57.15_IL	3-1/8" INTERBAY LINE ASSEMBLY
6	1	CL30074-175.82_IL-LOWER	3-1/8" INTERBAY LINE ASSEMBLY
5	1	CL30074-175.82_IL-UPPER	3-1/8" INTERBAY LINE ASSEMBLY
4	2	CL30074-114.67_CF-2	3-1/8" CENTERFEED ASSY 3-1/8" INPUT
3	1	CL30074-114.67_CF	3-1/8" CENTERFEED ASSY 3-1/8" INPUT
2	4	CL3064C-114.67	3-1/8" CENTERFEED ASSY 3-1/8" INPUT
1	8	AE-SHX3BR0	10" SHPX ELEMENT, 3" STEM w/ RADOMES

BILL OF MATERIAL

PROJECT NO.	30074/1	
ERI APPROVAL	NAME	DATE
DRAWN BY	MAP	8/16/2012
DRAFTING	DLB	8/17/2012
DESIGN MGR.	GA	8/17/2012
ENG.		
MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
FILE NAME	IA30074-1.idw	

ELECTRONICS RESEARCH INC. ESTABLISHED 1949
7777 GARDNER Rd. CHANDLER, IN 47610-9229 PHONE: (812) 925-6000 FAX: (812) 925-4030

TITLE: SHPX-8AC-SP INSTALLATION DETAILS
COLLEGE/FAIRBANKS, AK
NEW/KXLR/KWLF/KTDZ-94.3/95.9/98.1/103.9 MHz

SIZE	CAGE CODE	DWG NO.	REV
B	OZNS1	IA30074-1	A
SCALE: AS NOTED	WEIGHT: N/A	SHEET: 2 OF 2	

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)
INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994
1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

A-2 ERI Antenna Specification Sheet

TRANSMISSION SITE
FAIRBANKS, ALASKA

General Specifications

Antenna Type . . . . . .High Power FM-Broadcast, Suitable For Multiplexing
Model Number SHPXA-8A-SP
Number of Bay Levels .....Eight
Polarization ..... Right Hand Circular

Electrical Specifications

Antenna Input Power Capability . . . . . 30 kW Max (1)
Operating Frequency Band ..... 94.3 ~ 103.9 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
94.3	**28 KW**	**0°**	**0 %**	**0 %**	**4.481**	**-0.1786 dB**	**-0.445 dB**	**7.213 kW**
95.9	**28 KW**	**0°**	**0 %**	**0 %**	**4.508**	**-0.1805 dB**	**-0.497 dB**	**7.260 kW**
98.1	**28 KW**	**0°**	**0 %**	**0 %**	**4.505**	**-0.1824 dB**	**-0.519 dB**	**7.305 kW**
103.9	**28 KW**	**0°**	**0 %**	**0 %**	**4.284**	**-0.1862 dB**	**-0.489 dB**	**7.365 kW**

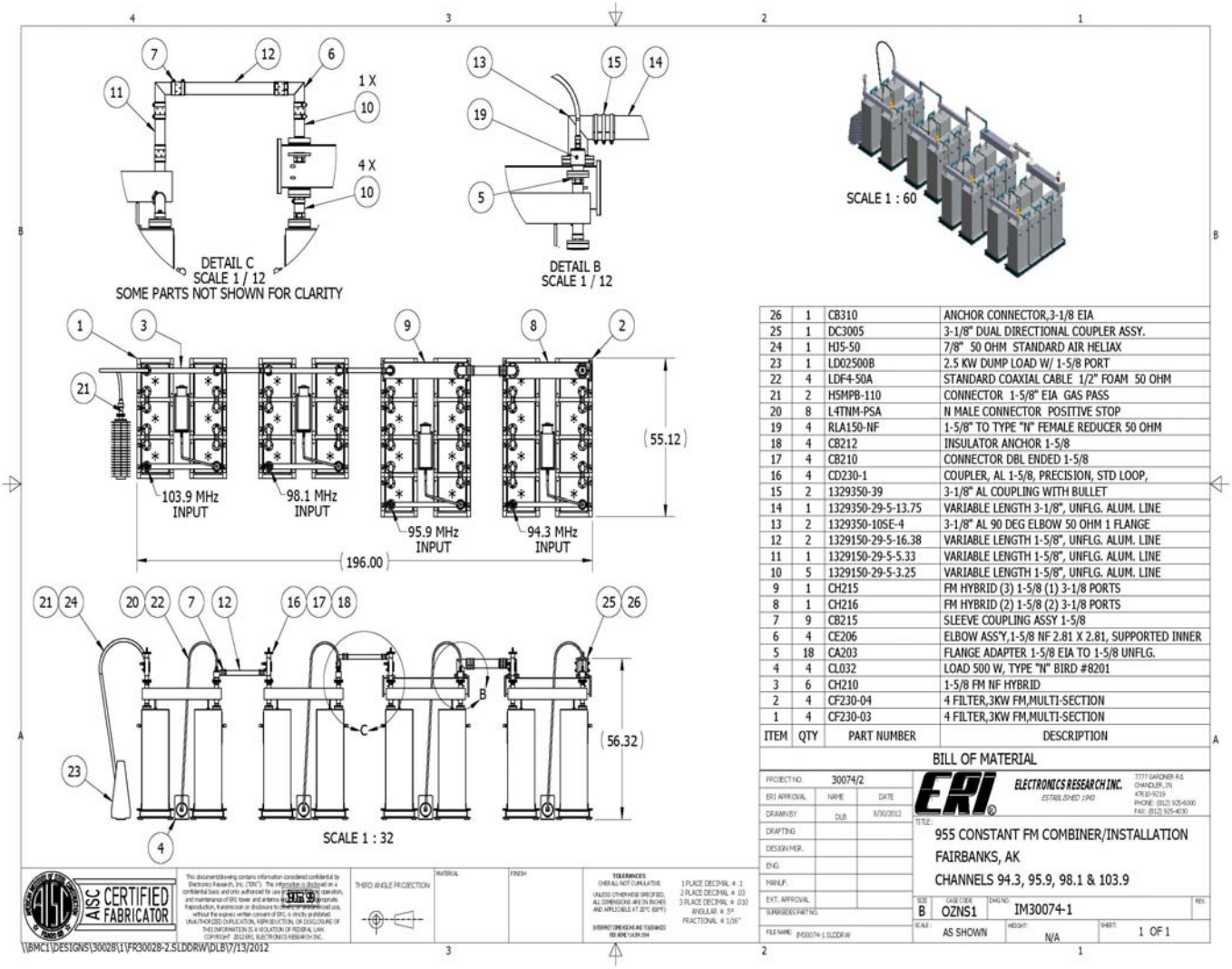
Mechanical Specifications

Antenna Feed System .....Single Input
Input Connector …… . 3 1/8”-50 Ohm EIA Flanged
Element Deicing.....Radomes
Interbay Spacing ..... 118.6875” Center to Center
Array Length..... 72 Feet
Construction Material (Antenna) ..... Galvanized Plated Steel and Stainless Steel
Construction Material (Mounting)..... Face

.

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 190 Feet of MACXLine-350 3 1/8” Rigid.
4) Losses Taken From Actual Combiner.

EXHIBIT A-3



ITEM	QTY	PART NUMBER	DESCRIPTION
26	1	CB310	ANCHOR CONNECTOR,3-1/8 EIA
25	1	DC3005	3-1/8" DUAL DIRECTIONAL COUPLER ASSY.
24	1	HJ5-50	7/8" 50 OHM STANDARD AIR HELIAX
23	1	LD02500B	2.5 KW DUMP LOAD W/ 1-5/8 PORT
22	4	LDF4-50A	STANDARD COAXIAL CABLE 1/2" FOAM 50 OHM
21	2	H5MPB-110	CONNECTOR 1-5/8" EIA GAS PASS
20	8	L4TNM-PSA	N MALE CONNECTOR POSITIVE STOP
19	4	RLA150-NF	1-5/8" TO TYPE "N" FEMALE REDUCER 50 OHM
18	4	CB212	INSULATOR ANCHOR 1-5/8
17	4	CB210	CONNECTOR DBL ENDED 1-5/8
16	4	CD230-1	COUPLER, AL 1-5/8, PRECISION, STD LOOP,
15	2	1329350-39	3-1/8" AL COUPLING WITH BULLET
14	1	1329350-29-5-13.75	VARIABLE LENGTH 3-1/8", UNFLG. ALUM. LINE
13	2	1329350-10SE-4	3-1/8" AL 90 DEG ELBOW 50 OHM 1 FLANGE
12	2	1329150-29-5-16.38	VARIABLE LENGTH 1-5/8", UNFLG. ALUM. LINE
11	1	1329150-29-5-5.33	VARIABLE LENGTH 1-5/8", UNFLG. ALUM. LINE
10	5	1329150-29-5-3.25	VARIABLE LENGTH 1-5/8", UNFLG. ALUM. LINE
9	1	CH215	FM HYBRID (3) 1-5/8 (1) 3-1/8 PORTS
8	1	CH216	FM HYBRID (2) 1-5/8 (2) 3-1/8 PORTS
7	9	CB215	SLEEVE COUPLING ASSY 1-5/8
6	4	CE206	ELBOW ASS'Y,1-5/8 NF 2.81 X 2.81, SUPPORTED INNER
5	18	CA203	FLANGE ADAPTER 1-5/8 EIA TO 1-5/8 UNFLG.
4	4	CL032	LOAD 500 W, TYPE "N" BIRD #8201
3	6	CH210	1-5/8 FM NF HYBRID
2	4	CF230-04	4 FILTER,3KW FM,MULTI-SECTION
1	4	CF230-03	4 FILTER,3KW FM,MULTI-SECTION

BILL OF MATERIAL

PROJECT NO. 30074/2

ERI APPROVAL NAME DATE

DRAWN BY DLB 8/30/2012

DRAFTING

DESIGN MGR.

ENG.

MANUF.

EXT. APPROVAL

SUPERSEDES PART NO.

FILE NAME: IM30074-1.SLDDRW

ELECTRONICS RESEARCH INC.
ESTABLISHED 1949
7777 GARDNER RD
CHANDLER, IN
47610-9233
PHONE: (812) 925-6000
FAX: (812) 925-4030

TITLE:
955 CONSTANT FM COMBINER/INSTALLATION
FAIRBANKS, AK
CHANNELS 94.3, 95.9, 98.1 & 103.9

SIZE B | CAGE CODE OZNS1 | DWG NO. IM30074-1 | REV.

SCALE: AS SHOWN | WEIGHT: N/A | SHEET: 1 OF 1

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)
1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR: ± 5°
FRACTIONAL ± 1/16"

\\BMC1\DESIGNS\30028\1\FR30028-2.SLDDRW\DLB\7/13/2012

A-4 ERI Combiner Specification Sheet

TRANSMISSION SITE
FAIRBANKS, ALASKA

General Specifications:

Multiplexer Type .....Band Pass Constant Impedance
Number of Combining Units ..... Four
Injected Port to Injected Port Isolation ..... < - 77 dB
Output Connector ..... 3 1/8 "50 Ohm EIA (Flanged)
Output Power (Designed) ..... 30 kW(1)

Heat Removal .....Natural Convection
Physical Arrangement ..... All Components Floor Standing

Injected Port Specifications:

Frequency Assignment ..... 94.3 ~ 95.9 ~ 98.1, and 103.9 MHz.
Power Rating, Each Injected Port (Designed)..... 7.6 kW
Input Connector .....1-5/8" 50 Ohm EIA (Flanged).
VSWR.....< 1.06:1 @ +/-150 KHz.(2)
Group Delay .....Less than 120 ns Overall Variation, Carrier @ +/- 150 KHz.
Insertion Loss (Measured):

94.3 MHz. ..... - 0.445 dB
95.9 MHz. ..... - 0.497 dB
98.1 MHz. ..... - 0.519 dB
103.9 MHz. ..... - 0.489 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

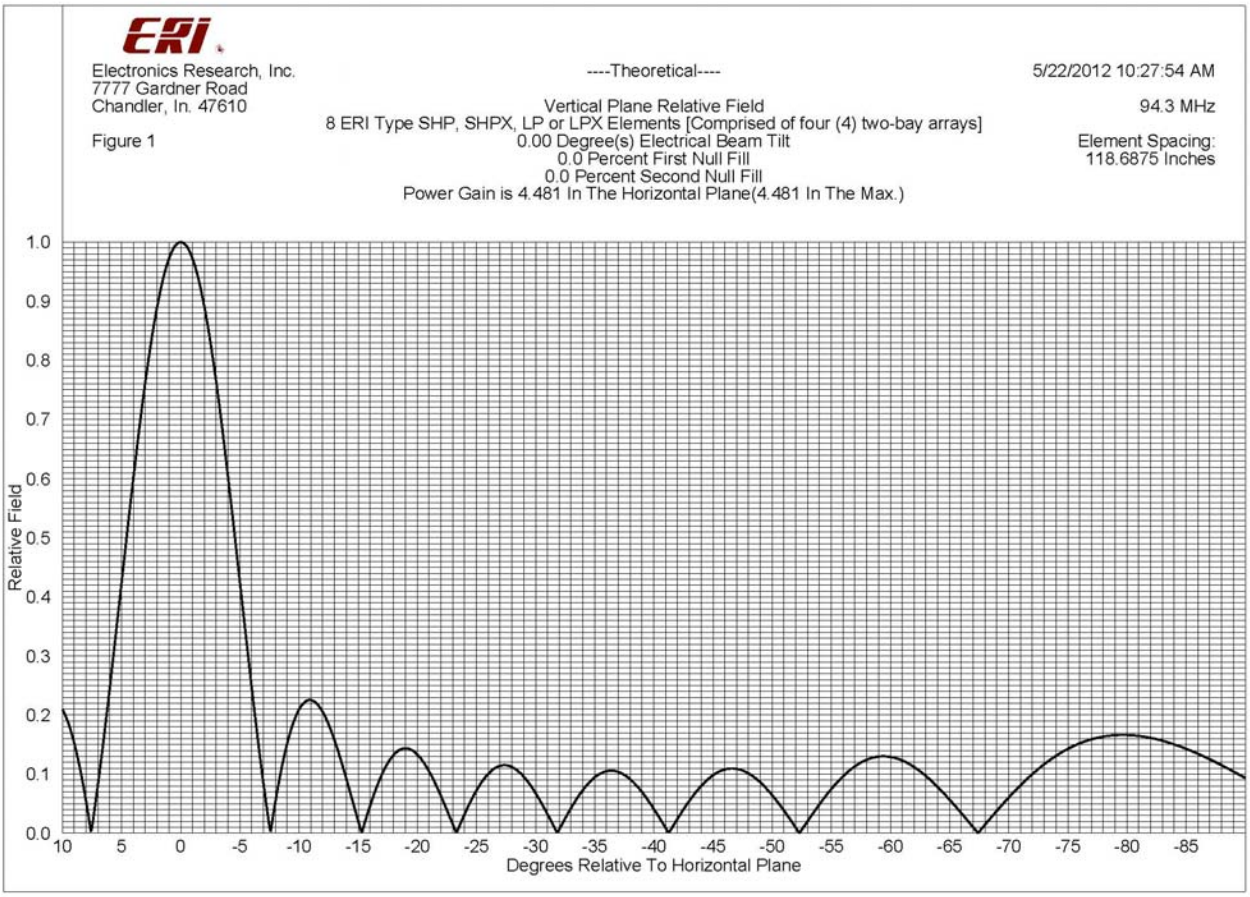

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 1
----Theoretical----
Vertical Plane Relative Field
8 ERI Type SHP, SHPX, LP or LPX Elements [Comprised of four (4) two-bay arrays]
0.00 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.481 In The Horizontal Plane(4.481 In The Max.)
5/22/2012 10:27:54 AM
94.3 MHz
Element Spacing:
118.6875 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

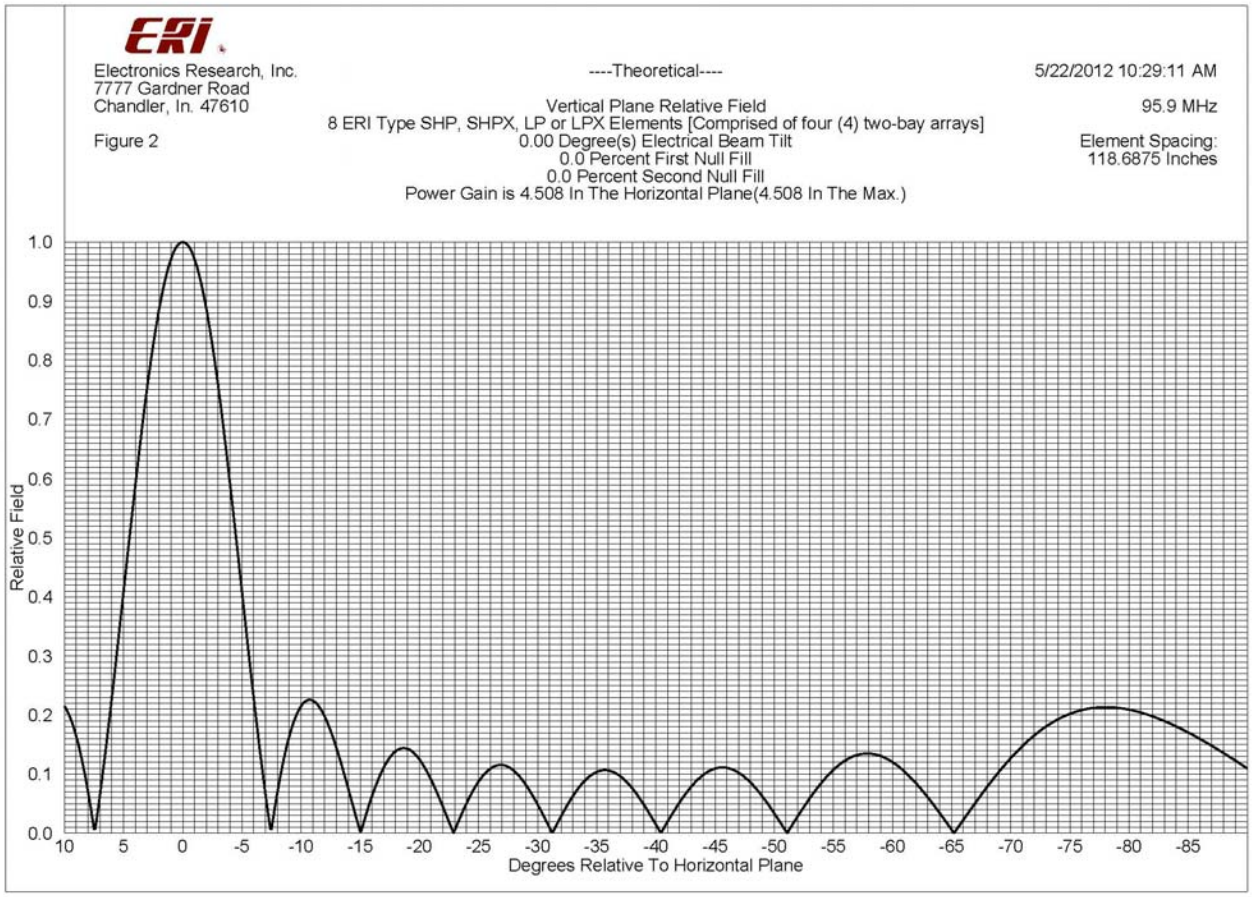
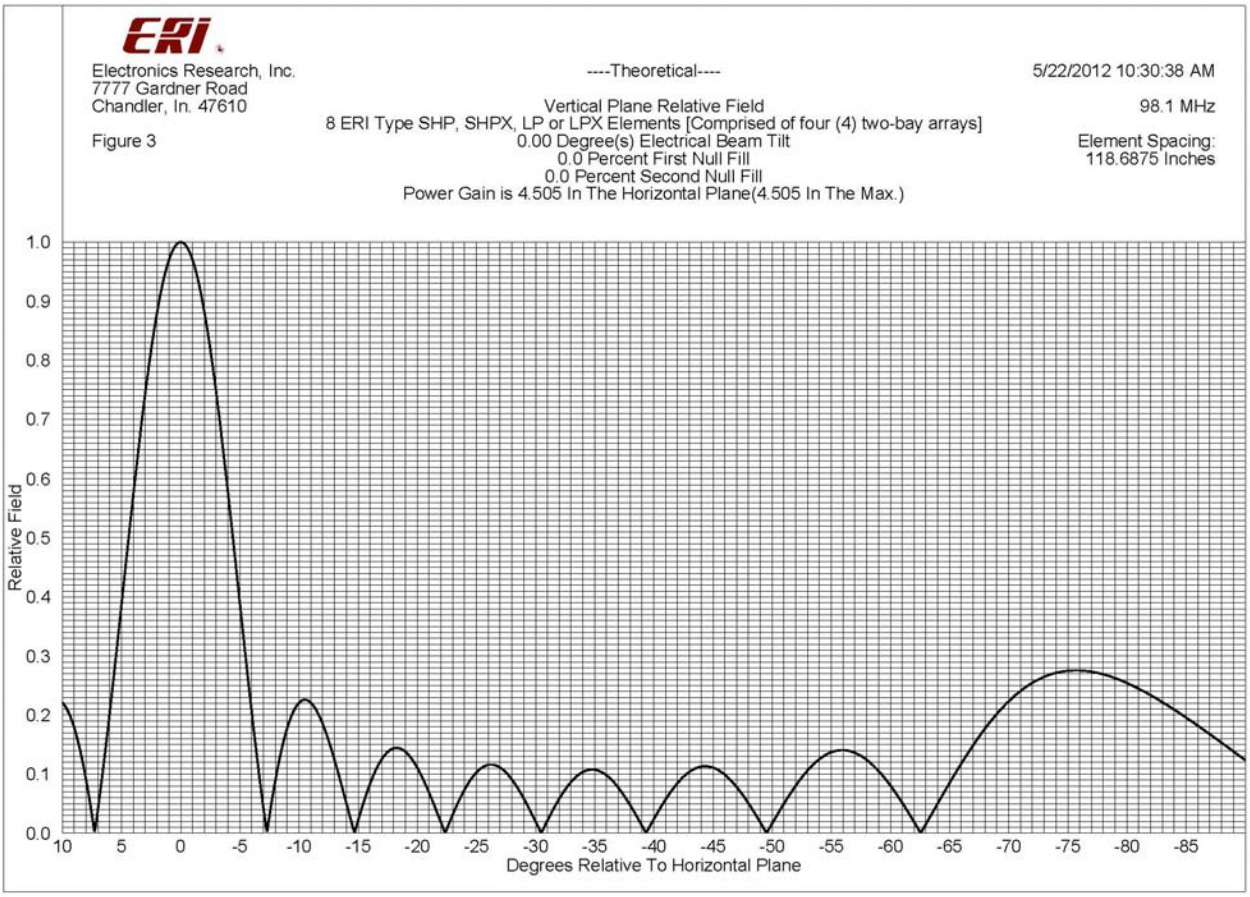
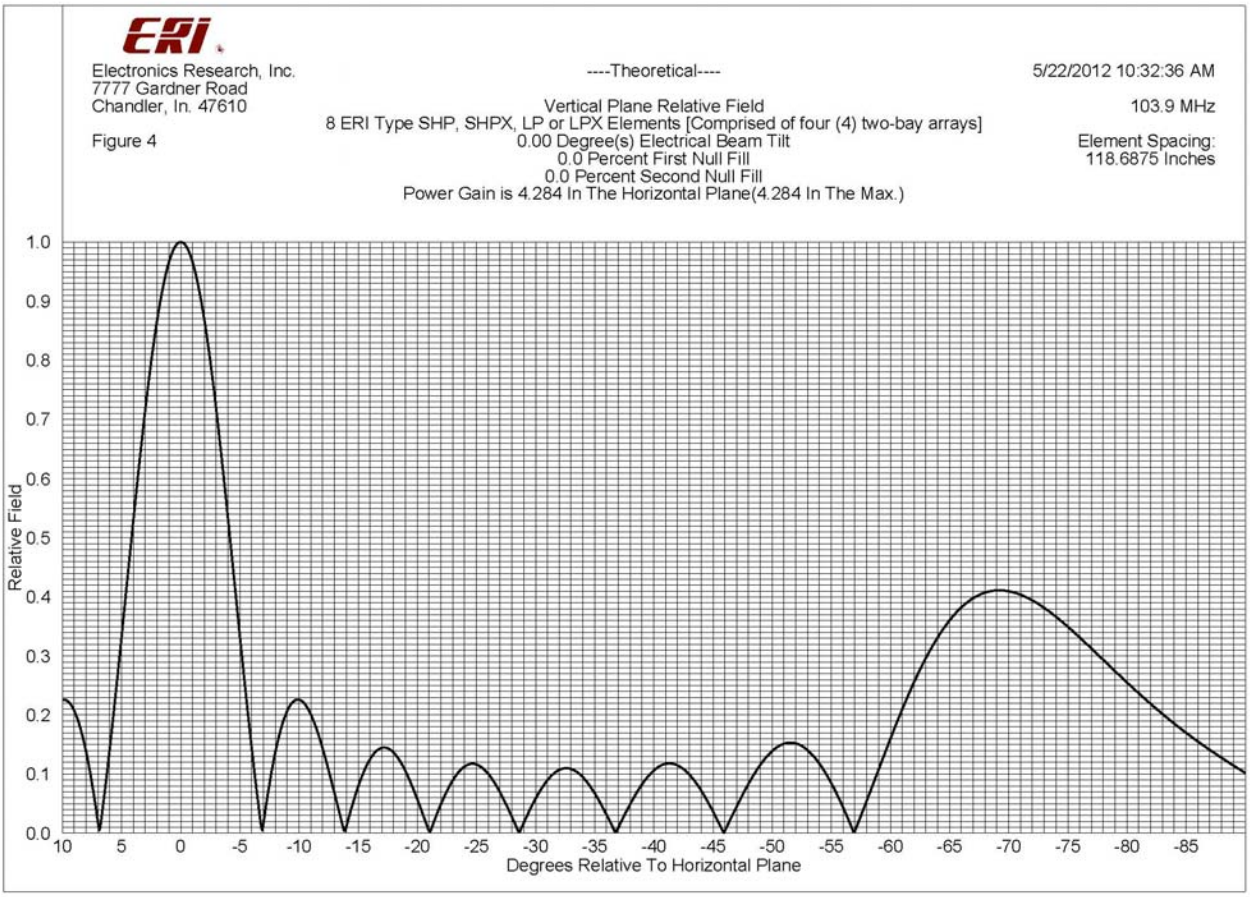

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610
Figure 2
----Theoretical----
Vertical Plane Relative Field
8 ERI Type SHP, SHPX, LP or LPX Elements [Comprised of four (4) two-bay arrays]
0.00 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.508 In The Horizontal Plane(4.508 In The Max.)
5/22/2012 10:29:11 AM
95.9 MHz
Element Spacing:
118.6875 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
8 ERI Type SHP, SHPX, LP or LPX Elements [Comprised of four (4) two-bay arrays]
0.00 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.505 In The Horizontal Plane(4.505 In The Max.)
5/22/2012 10:30:38 AM
98.1 MHz
Element Spacing:
118.6875 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
8 ERI Type SHP, SHPX, LP or LPX Elements [Comprised of four (4) two-bay arrays]
0.00 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 4.284 In The Horizontal Plane(4.284 In The Max.)
5/22/2012 10:32:36 AM
103.9 MHz
Element Spacing:
118.6875 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