# Report Of Intermodulation Product Findings

## Tulsa, Oklahoma

| | |
|---|---|
| KWEN | 95.5 MHz. |
| KRAV | 96.5 MHz. |
| KMOD | 97.5 MHz. |

**Job # 21602**

**August 16, 2008**

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

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## Tulsa, Oklahoma

Report of Findings for Intermodulation Product Measurements



Exhibits Accompanying This Report

# REPORT OF FINDINGS
# KWEN / KRAV / KMOD
95.5 MHz. / 96.5 MHz. / 97.5 MHz.

**Introduction:** This report of findings is based on data collected at the KWEN, KRAV, and KMOD broadcast facility located in Tulsa, Oklahoma. The report includes measurements offered as proof that the combined operations of KWEN (95.5 MHz), KRAV (96.5 MHz.), and KMOD ( 97.6 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 multiplex system are less than the maximum allowable level as required by section 73.317 (b) through (d). Mark Garrison of Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized herein on August 16, 2008.

**The following exhibits are provided:**

Exhibit A:
- A-1 Drawing Depicting Antenna.
- A-2 SHPX-10BC-SP Antenna Specification Sheet.
- A-3 Drawing Depicting Multiplexing Scheme.
- A-4 973 Series Constant Impedance 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 constant impedance 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 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 three FM stations operating from the combined antenna system. The KWEN, KRAV, and KMOD system is fundamentally comprised of antenna, feed line and constant impedance system. The SHPX-10BC-SP (antenna) and 973 Series Constant Impedance combiner system and 1431 feet of 6 1/8"MAXLINE 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 three transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a Constant Impedance combiner was installed. Specifically, the Constant Impedance Combiner utilizes three ERI Model 973-8 series combiners with nonadjacent coupling and group delay compensation module for each station, which is illustrated in the attached Exhibit A-3. The constant impedance combiner, fully assembled, exhibited transmitter port-to-port isolation in excess of -56dB. 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 973 series constant impedance combiner 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 -35 dB directivity and a forward signal sample of -60 dB.

The forward port of the coupler was used for sampling the outgoing carrier levels and IM products. The IM sampled signal was fed by shielded cable into a Band Pass Filter where all extraneous energy was steeply attenuated. Various attenuation pads were used, when needed, on the band pass filter and/or the FIM-71 to ensure an adequate signal level for measurements without overloading the measurement equipment. A Potomac Instruments FIM-71 Field Strength Receiver Serial # 242 was employed to record the level of all signals investigated. To facilitate the selective tuning of the Receiver and Band Pass Filter a Wavetek Model 3000 Serial # 7512028 signal generator was used. A Rhode & Swartz Analyzer with Spectrum Analyzer option Model ZVL3 Serial # 100396 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, Constant Impedance Combiner, Feed Line and Antenna were adjusted to optimal performance. In addition, it was confirmed before taking any measurements that all stations of concern were operating at their full licensed power level. From the equipment setup described above, the relative output signal level of each stations forward carrier was made. The resulting signal levels of these measurements are listed in Table 1, column labeled "Adjusted Level". This level will be used as the reference level for possible IM products of each carrier and was necessary to confirm that no significant levels of spurious energy, referenced to each carrier, were present from any transmitter operating from the multiplexed system.

## Table 1 - Carrier Reference Levels.

| Transmitter Frequency (MHz) | Interfering Frequency (MHz) | Pad (dB) | Bandpass Filter Loss (dB) | Total Loss | Full Scale Range (dBµ) | Scale Reading (dBµ) | Adjusted Level (dBµ) | Carrier Reference Level (dBµ) | Level Referenced to Carrier (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **95.5** | **Ref.** | **6** | | **6** | **120** | **7** | | **119** | |
| **96.5** | **Ref.** | **6** | | **6** | **120** | **7** | | **119** | |
| **97.5** | **Ref.** | **6** | | **6** | **120** | **6.5** | | **119.5** | |

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.

| Product Number | Product Frequency (MHz) | Transmitter Frequency (MHz) | Interfering Frequency (MHz) |
|---|---|---|---|
| 1 | 92.5 | 95.5 | 98.5 |
| 2 | 93.5 | 95.5 | 97.5 |
| 3 | 94.5 | 95.5 | 96.5 |
| 4 | 94.5 | 96.5 | 98.5 |
| 5 | 95.5 | 96.5 | 97.5 |
| 6 | 96.5 | 97.5 | 98.5 |
| 7 | 97.5 | 96.5 | 95.5 |
| 8 | 98.1 | 95.5 | 92.9 |
| 9 | 98.5 | 97.5 | 96.5 |
| 10 | 99.5 | 97.5 | 95.5 |
| 11 | 100.1 | 96.5 | 92.9 |
| 12 | 102.1 | 97.5 | 92.9 |

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

| IM Measurements Taken in Tulsa, Oklahoma 8-16-08 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Product Frequency (MHz)** | **Transmitter Frequency (MHz)** | **Interfering Frequency (MHz)** | **Pad (dB)** | **Bandpass Filter Loss (dB)** | **Total Loss** | **Full Scale Range (dBµ)** | **Scale Reading (dBµ)** | **Adjusted Level (dBµ)** | **Carrier Reference Level (dBµ)** | **Level Referenced to Carrier (dB)** | **Notes*** |
| 92.5 | 95.5 | 98.5 | 6 | 11.5 | 17.5 | 20 | 20 | 17.5 | 119 | -101.5 | |
| 93.5 | 95.5 | 97.5 | 6 | 11.9 | 17.9 | 20 | 20 | 17.9 | 119 | -101.1 | |
| 94.5 | 95.5 | 96.5 | 6 | 12 | 18 | 20 | 20 | 18 | 119 | -101 | |
| 94.5 | 96.5 | 98.5 | 6 | 12 | 18 | 20 | 20 | 18 | 119 | -101 | |
| 95.5 | 96.5 | 97.5 | 6 | 12 | 18 | 20 | 20 | 18 | 119 | -101 | |
| 96.5 | 97.5 | 98.5 | 6 | 12 | 18 | 20 | 6 | 32 | 119.5 | -87.5 | |
| 97.5 | 96.5 | 95.5 | 6 | 11.9 | 17.9 | 20 | 20 | 17.9 | 119 | -101.1 | |
| 98.1 | 95.5 | 92.9 | 6 | 11.1 | 17.1 | 20 | 2 | 35.1 | 119 | -83.9 | |
| 98.5 | 97.5 | 96.5 | 6 | 13 | 19 | 20 | 2 | 37 | 119.5 | -82.5 | |
| 99.5 | 97.5 | 95.5 | 6 | 13 | 19 | 20 | 20 | 19 | 119.5 | -100.5 | |
| 100.1 | 96.5 | 92.9 | 6 | 12.1 | 18.1 | 20 | 20 | 18.1 | 119 | -100.9 | |
| 102.1 | 97.5 | 92.9 | 6 | 13 | 19 | 20 | 20 | 19 | 119.5 | -100.5 | |

The R & S Analyzer with an option 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 August 16, 2008 as summarized in this document, I, Mark Garrison, find the subject system- specifically the transmitter and filter system for the operation of KWEN, KRAV, and KMOD 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 KWEN, KRAV, and KMOD comply with the requirements of Section 73.317 paragraph (b) through (d) of the FCC Rules and Regulations.

Respectfully submitted,
Electronics Research, Inc.

Mark Garrison, Field Technician

State of Indiana

( County of Warrick ) SS:

**AFFIDAVIT**

I, Mark Garrison, 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 6 years. I am familiar with and have assisted in the design, manufacturing and installation of FM Antennas and FM Multiplexers in my 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 COX Radio on behalf of radio Stations KWEN, KRAV, and KMOD of Tulsa, Okalohma. to prepare this Report Of Findings.

Mark Garrison; Field Technician

Mark Garrison

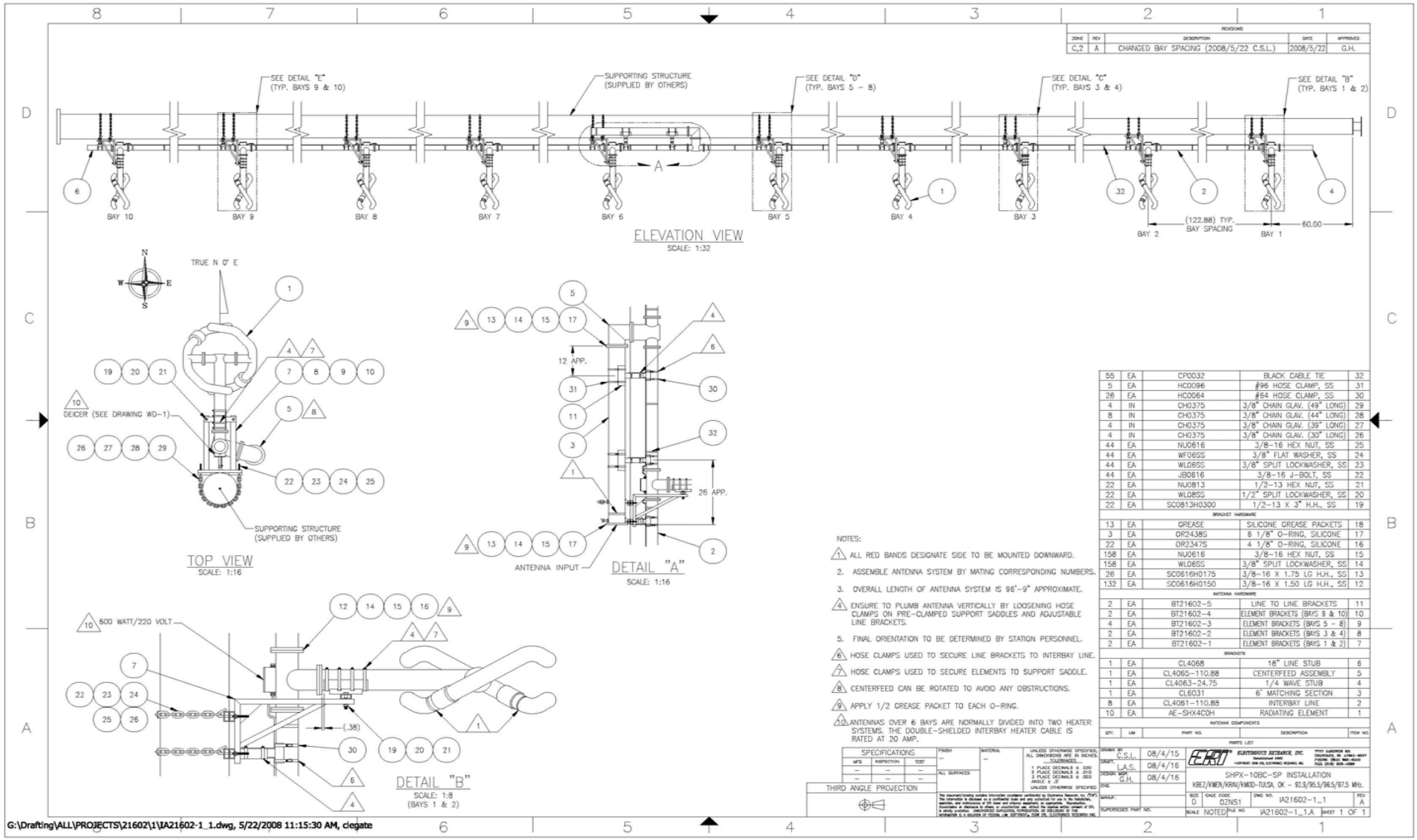
*Subscribed and sworn to before me on this 18th, day of August, 2008.*

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

# EXHIBIT A-1


REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
C,2 A CHANGED BAY SPACING (2008/5/22 C.S.L.) 2008/5/22 G.H.
SEE DETAIL "E" (TYP. BAYS 9 & 10)
SUPPORTING STRUCTURE (SUPPLIED BY OTHERS)
SEE DETAIL "D" (TYP. BAYS 5 - 8)
SEE DETAIL "C" (TYP. BAYS 3 & 4)
SEE DETAIL "B" (TYP. BAYS 1 & 2)
BAY 10
BAY 9
BAY 8
BAY 7
BAY 6
BAY 5
BAY 4
BAY 3
BAY 2
BAY 1
(122.88) TYP. BAY SPACING
60.00
ELEVATION VIEW
SCALE: 1:32
TRUE N 0° E
DEICER (SEE DRAWING WD-1)
SUPPORTING STRUCTURE (SUPPLIED BY OTHERS)
TOP VIEW
SCALE: 1:16
12 APP.
26 APP.
ANTENNA INPUT
DETAIL "A"
SCALE: 1:16
600 WATT/220 VOLT
(.38)
DETAIL "B"
SCALE: 1:8
(BAYS 1 & 2)
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 96'-9" 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 SUPPORT SADDLE.
8. CENTERFEED CAN BE ROTATED TO AVOID ANY OBSTRUCTIONS.
9. APPLY 1/2 GREASE PACKET TO EACH O-RING.
10. ANTENNAS OVER 6 BAYS ARE NORMALLY DIVIDED INTO TWO HEATER SYSTEMS. THE DOUBLE-SHIELDED INTERBAY HEATER CABLE IS RATED AT 20 AMP.
SPECIFICATIONS
THIRD ANGLE PROJECTION
55 EA CP0032 BLACK CABLE TIE 32
5 EA HC0096 #96 HOSE CLAMP, SS 31
26 EA HC0064 #64 HOSE CLAMP, SS 30
4 IN CH0375 3/8" CHAIN GLAV. (49" LONG) 29
8 IN CH0375 3/8" CHAIN GLAV. (44" LONG) 28
4 IN CH0375 3/8" CHAIN GLAV. (39" LONG) 27
4 IN CH0375 3/8" CHAIN GLAV. (30" LONG) 26
44 EA NU0616 3/8-16 HEX NUT, SS 25
44 EA WF06SS 3/8" FLAT WASHER, SS 24
44 EA WL06SS 3/8" SPLIT LOCKWASHER, SS 23
44 EA JB0616 3/8-16 J-BOLT, SS 22
22 EA NU0813 1/2-13 HEX NUT, SS 21
22 EA WL08SS 1/2" SPLIT LOCKWASHER, SS 20
22 EA SC0813H0300 1/2-13 X 3" H.H., SS 19
BRACKET HARDWARE
13 EA GREASE SILICONE GREASE PACKETS 18
3 EA OR2438S 6 1/8" O-RING, SILICONE 17
22 EA OR2347S 4 1/8" O-RING, SILICONE 16
158 EA NU0616 3/8-16 HEX NUT, SS 15
158 EA WL06SS 3/8" SPLIT LOCKWASHER, SS 14
26 EA SC0616H0175 3/8-16 X 1.75 LG H.H., SS 13
132 EA SC0616H0150 3/8-16 X 1.50 LG H.H., SS 12
ANTENNA HARDWARE
2 EA BT21602-5 LINE TO LINE BRACKETS 11
2 EA BT21602-4 ELEMENT BRACKETS (BAYS 9 & 10) 10
4 EA BT21602-3 ELEMENT BRACKETS (BAYS 5 - 8) 9
2 EA BT21602-2 ELEMENT BRACKETS (BAYS 3 & 4) 8
2 EA BT21602-1 ELEMENT BRACKETS (BAYS 1 & 2) 7
BRACKETS
1 EA CL4068 18" LINE STUB 6
1 EA CL4065-110.88 CENTERFEED ASSEMBLY 5
1 EA CL4063-24.75 1/4 WAVE STUB 4
1 EA CL6031 6' MATCHING SECTION 3
8 EA CL4051-110.88 INTERBAY LINE 2
10 EA AE-SHX4C0H RADIATING ELEMENT 1
ANTENNA COMPONENTS
QTY. U/M PART NO. DESCRIPTION ITEM NO.
PARTS LIST
DRAWN BY C.S.L. 08/4/15
DRAFT L.A.S. 08/4/16
DESIGN APP G.H. 08/4/16
ENG.
MFG.
SUPERSEDES PART NO.
ELECTRONICS RESEARCH, INC.
SHPX-10BC-SP INSTALLATION
KBEZ/KMEN/KRRV/KMOD-TULSA, OK - 92.9/95.5/96.5/97.5 MHz.
SIZE D CAGE CODE 0ZNS1 DWG NO. IA21602-1_1 REV A
SCALE NOTED FILE NO. IA21602-1_1.A SHEET 1 OF 1
G:\Drafting\ALL\PROJECTS\21602\1\IA21602-1_1.dwg, 5/22/2008 11:15:30 AM, clegate

# A-2 ERI Antenna Specification Sheet

Tulsa, Oklahoma

## *General Specifications*

Antenna Type……High Power FM-Broadcast, Suitable For Diplexing
Model Number ..... SHPX-10BC-SP
Number of Bay .....Ten
Polarization..... Right Hand Circular

## *Electrical Specifications*

Antenna Input Power Capability . . . . . .... 75 KW Max (1)
Operating Frequency Band..... 95.5, 96.5, & 97.5 Megahertz.
VSWR. . . . . <1.04:1 @ 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° | 1% | 0% | 5.684 | -.6726 db | -.611 db | 23.6 KW |
| 96.5 | 100 KW | 0° | 5 % | 0% | 5.615 | -.6726 db | -.523 db | 23.4 KW |
| 97.5 | 100 KW | 0° | 12% | 0% | 5.427 | -.6726 db | -.509 db | 24.1 KW |

## *Mechanical Specifications*

Antenna Feed System..... Fed With 6 1/8” ERI MACXLine
Input Connector …… . 6 1/8”-50 Ohm EIA Flanged
Element Deicing.....Heaters
Interbay Spacing..... 122.875” Center to Center
Array Length ..... 96’ 9”
Construction Material (Antenna) ..... All Noncorrosive
Construction Material (Mounting) ..... 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 1431 Feet of 6 1/8 ERI MAXLINE Rigid.**
**4) Losses Taken From Actual Combiner.**

# EXHIBIT A-3

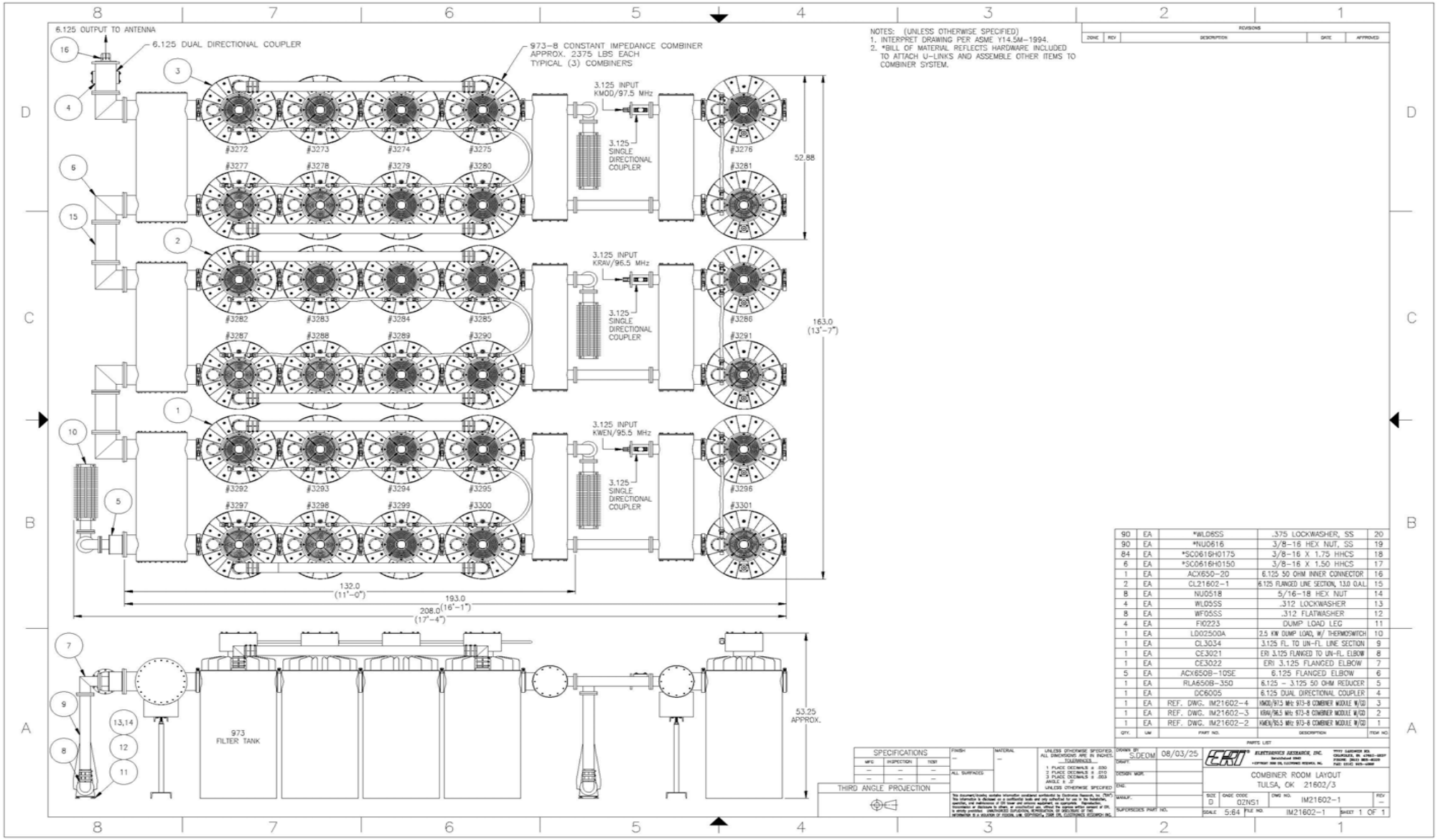

6.125 OUTPUT TO ANTENNA
6.125 DUAL DIRECTIONAL COUPLER
973-8 CONSTANT IMPEDANCE COMBINER
APPROX. 2375 LBS EACH
TYPICAL (3) COMBINERS
3.125 INPUT
KMOD/97.5 MHz
3.125 INPUT
KRAV/96.5 MHz
3.125 INPUT
KWEN/95.5 MHz
3.125
SINGLE
DIRECTIONAL
COUPLER
#3272
#3273
#3274
#3275
#3276
#3277
#3278
#3279
#3280
#3281
#3282
#3283
#3284
#3285
#3286
#3287
#3288
#3289
#3290
#3291
#3292
#3293
#3294
#3295
#3296
#3297
#3298
#3299
#3300
#3301
52.88
163.0
(13'-7")
132.0
(11'-0")
193.0
(16'-1")
208.0
(17'-4")
973
FILTER TANK
53.25
APPROX.
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. INTERPRET DRAWING PER ASME Y14.5M-1994.
2. *BILL OF MATERIAL REFLECTS HARDWARE INCLUDED TO ATTACH U-LINKS AND ASSEMBLE OTHER ITEMS TO COMBINER SYSTEM.
REVISIONS
ZONE
REV
DESCRIPTION
DATE
APPROVED
PARTS LIST
QTY.
U/M
PART NO.
DESCRIPTION
ITEM NO.
90 EA *WL06SS .375 LOCKWASHER, SS 20
90 EA *NU0616 3/8-16 HEX NUT, SS 19
84 EA *SC0616H0175 3/8-16 X 1.75 HHCS 18
6 EA *SC0616H0150 3/8-16 X 1.50 HHCS 17
1 EA ACX650-20 6.125 50 OHM INNER CONNECTOR 16
2 EA CL21602-1 6.125 FLANGED LINE SECTION, 13.0 O.A.L. 15
8 EA NU0518 5/16-18 HEX NUT 14
4 EA WL05SS .312 LOCKWASHER 13
8 EA WF05SS .312 FLATWASHER 12
4 EA FI0223 DUMP LOAD LEG 11
1 EA LD02500A 2.5 KW DUMP LOAD, W/ THERMOSWITCH 10
1 EA CL3034 3.125 FL. TO UN-FL. LINE SECTION 9
1 EA CE3021 ERI 3.125 FLANGED TO UN-FL. ELBOW 8
1 EA CE3022 ERI 3.125 FLANGED ELBOW 7
5 EA ACX650B-10SE 6.125 FLANGED ELBOW 6
1 EA RLA650B-350 6.125 - 3.125 50 OHM REDUCER 5
1 EA DC6005 6.125 DUAL DIRECTIONAL COUPLER 4
1 EA REF. DWG. IM21602-4 KMOD/97.5 MHz 973-8 COMBINER MODULE W/GD 3
1 EA REF. DWG. IM21602-3 KRAV/96.5 MHz 973-8 COMBINER MODULE W/GD 2
1 EA REF. DWG. IM21602-2 KWEN/95.5 MHz 973-8 COMBINER MODULE W/GD 1
SPECIFICATIONS
THIRD ANGLE PROJECTION
DRAWN BY: S.DEOM 08/03/25
ELECTRONICS RESEARCH, INC.
COMBINER ROOM LAYOUT
TULSA, OK 21602/3
SIZE: D
CAGE CODE: 0ZNS1
DWG NO.: IM21602-1
REV: —
SCALE: 5:64
FILE NO.: IM21602-1
SHEET 1 OF 1

**EXHIBIT A-4**

# A-4 ERI Combiner Specification Sheet

Tulsa, Oklahoma

## *General Specifications:*

**Multiplexer Type 973 Series Constant Impedance with Nonadjacent coupler's and Group Delay**
**Number of Combining Units ..... Three**
**Injected Port to Injected Port Isolation..... < - 56 dB**
**Output Connector ..... 6 1/8 "50 Ohm EIA (Flanged)**
**Output Power (Designed) ..... 28 KW (1)**

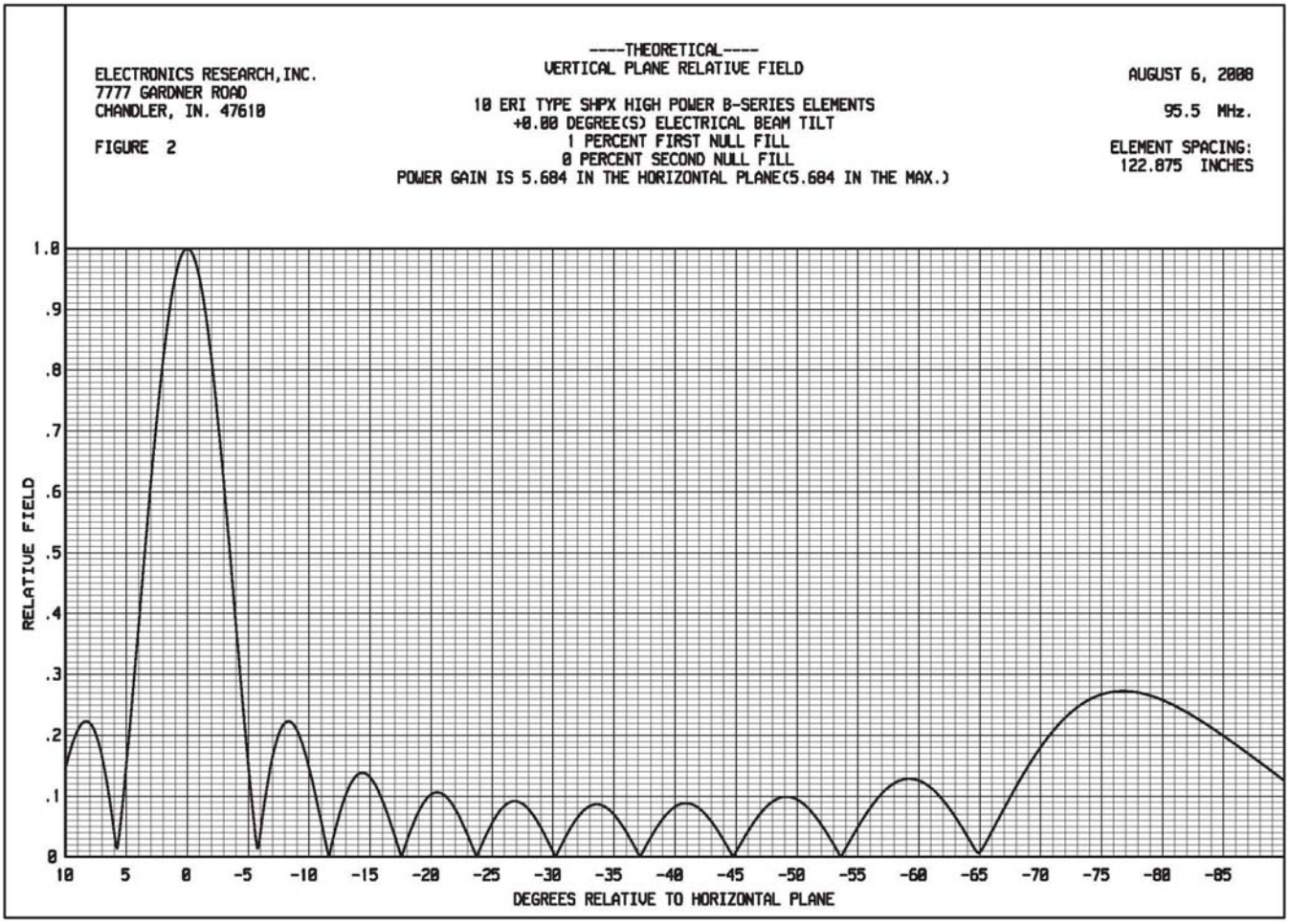
**Heat Removal..... Forced Air**
**Physical Arrangement.....All Components floor standing**

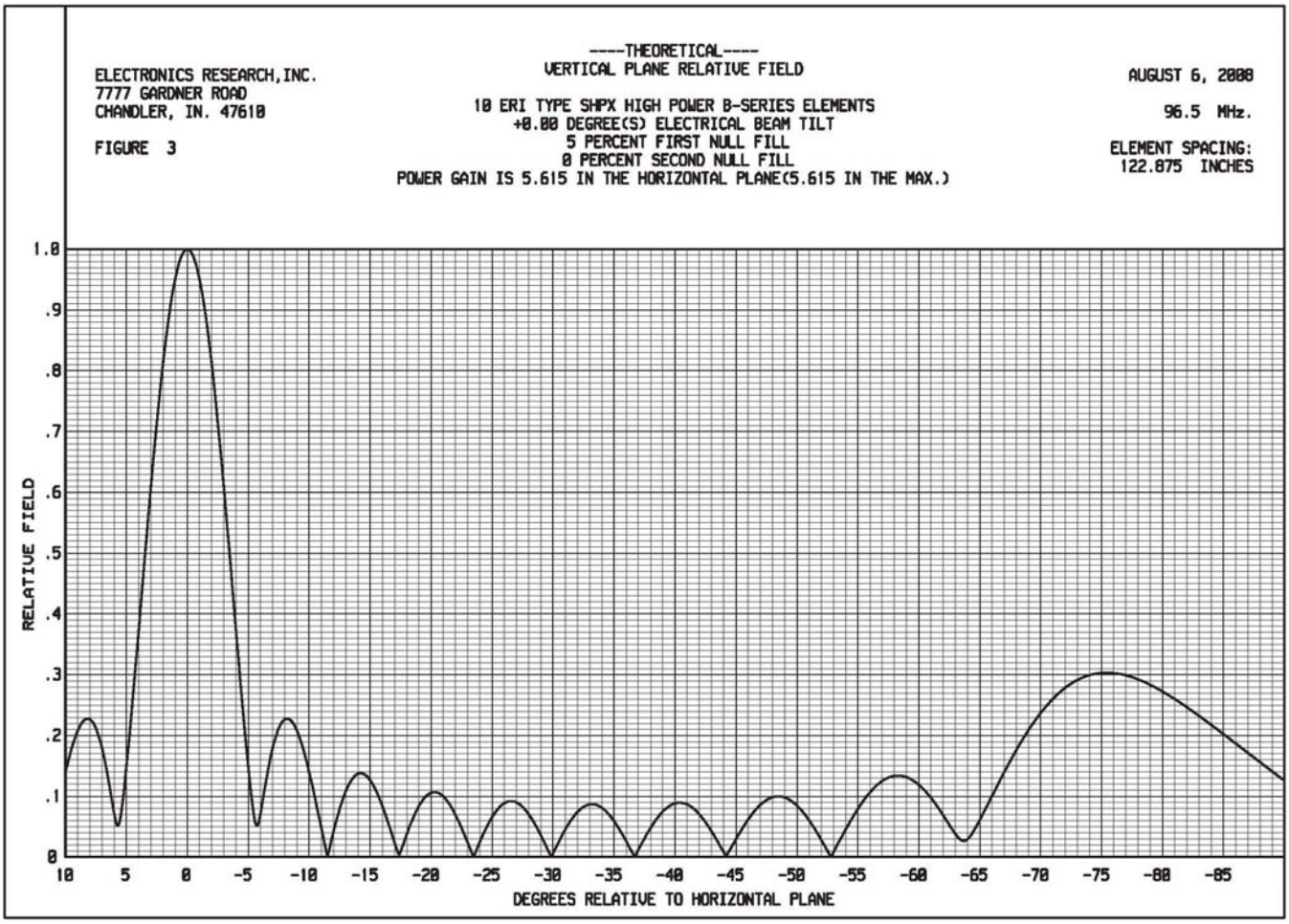
## *Injected Port Specifications:*

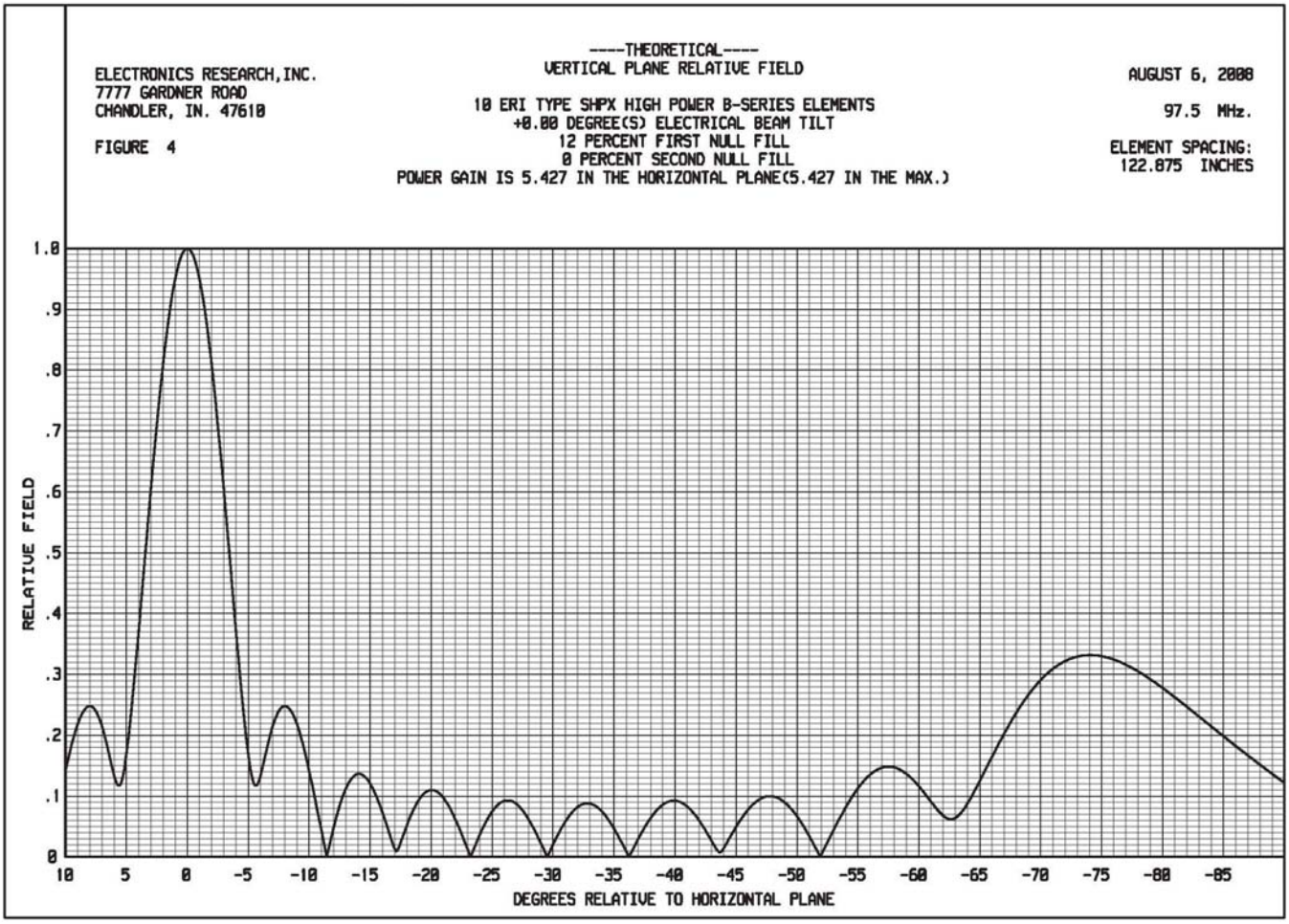
**Frequency Assignment ..... 95.5, 96.5, & 97.5 MHz.**
**Power Rating, Each Injected Port (Designed) ..... 25 KW**
**Input Connector ..... 3-1/8" 50 Ohm EIA (Flanged)**
**VSWR..... < 1.08:1 @ +/-150 KHz. (2**
**Group Delay..... Less than 100ns Overall Variation, Carrier @ +/- 150 KHz.**
**Insertion Loss (Measured):**

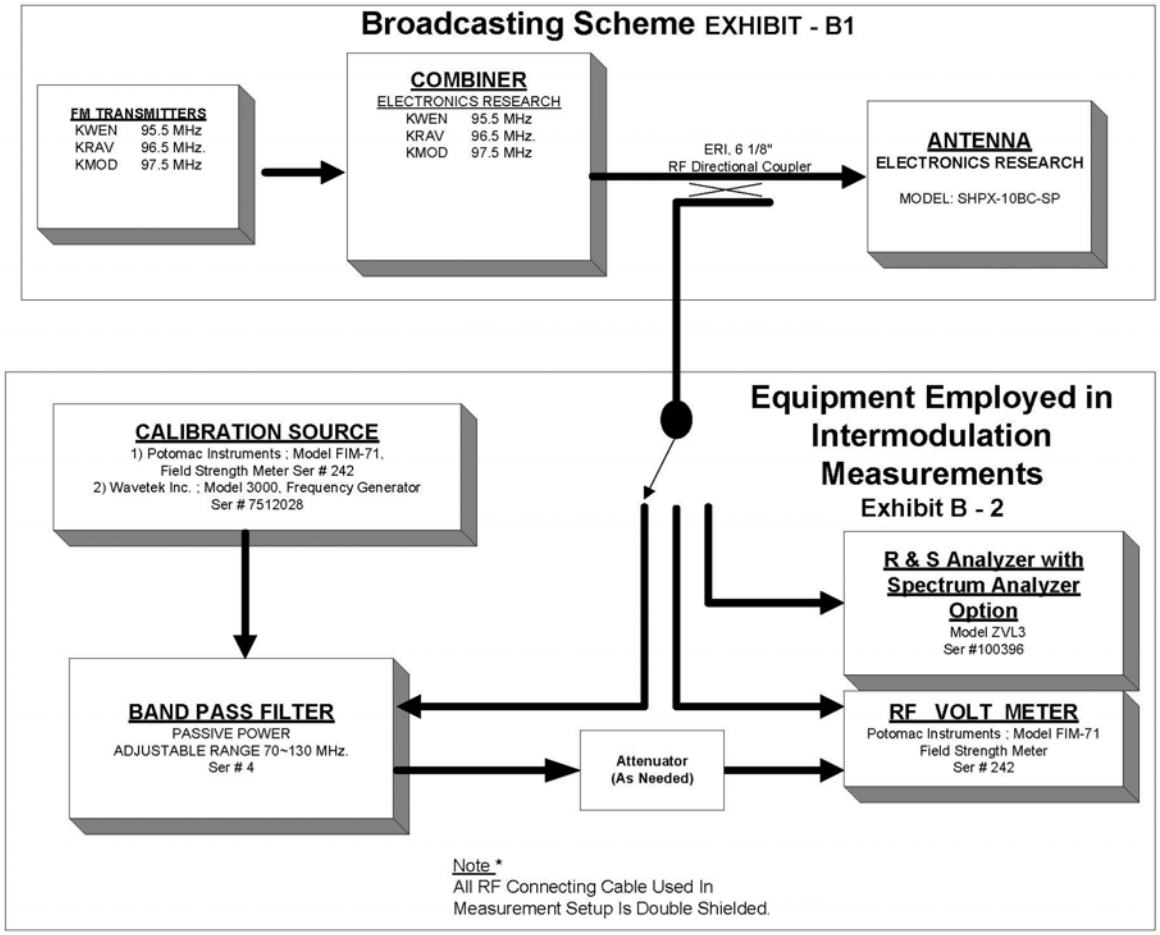
**95.5 MHz. ……. - 0.611 dB**
**96.5 MHz…… - 0.523 dB**
**97.6 MHz…… -0.509 dB**

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


ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE 2
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
10 ERI TYPE SHPX HIGH POWER B-SERIES ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
1 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.684 IN THE HORIZONTAL PLANE(5.684 IN THE MAX.)
AUGUST 6, 2008
95.5 MHz.
ELEMENT SPACING:
122.875 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


ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE 3
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
10 ERI TYPE SHPX HIGH POWER B-SERIES ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
5 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.615 IN THE HORIZONTAL PLANE(5.615 IN THE MAX.)
AUGUST 6, 2008
96.5 MHz.
ELEMENT SPACING:
122.875 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


ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE 4
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
10 ERI TYPE SHPX HIGH POWER B-SERIES ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
12 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.427 IN THE HORIZONTAL PLANE(5.427 IN THE MAX.)
AUGUST 6, 2008
97.5 MHz.
ELEMENT SPACING:
122.875 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