ELECTRONICS RESEARCH, INC.
7777 Gardner Road, Chandler, Indiana 47610, (812) 925-6000, Fax (812) 925-4030

Report Of Intermodulation Product Findings

RICHLAND TOWER COMBINED BROADCAST FACILITY
KANSAS CITY , MISSOURI

KCMO	***94.9***
KRBZ	***96.5***
KUDL	***98.1***
KQRC	***98.9***
KYYS	***99.7***
KCFX	***101.1***
KFME	***105.1***

May 2003

Electronics Research Inc.
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REPORT OF FINDINGS
RICHLAND TOWER BROADCAST FACILITY
KANSAS CITY , MISSOURI

Introduction : This report of findings is based on data collected at the Richland Towers Master FM facility located in Kansas City, Missouri. The report includes measurements offered as proof that the multiplexing equipment used to combine the seven (7) FM transmitters into a common transmission system performs 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). The multiplexing system, transmission line, and the master FM antenna is a completely integrated system and is used by the following broadcast stations :

KCMO (94.9 Mhz.) **KRBZ** (96.5 Mhz.) **KUDL** (98.1 Mhz.) **KQRC** (98.9 Mhz.)
KYYS (99.7 Mhz.) **KCFX** (101.1 Mhz.) **KFME** (105.1 Mhz.)

Note, For brevity the stations listed above will be refereed to as *The FM Broadcast Group*.

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). A qualified engineer representing Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized in this report.

The Following Exhibits Are Provided:

Exhibit Group A:
- A-1 Drawing Depicting Antenna.
- A-2 COG-1083-10CP Antenna Specification Sheet.
- A-3 Drawing Depicting Multiplexing Scheme.
- A-4 Constant Impedance Multiplexer Specification Sheet.
- A-5 Theoretical Vertical Plane Relative Field Antenna Plots
- A-6 Feed System Detail

Exhibit Group B:
- B-1 Equipment Employed In Intermodulation Product Measurement.
- B-2 Broadcasting Scheme of the Multiplexed Systems.
- B-3 Calculated Product Chart.

Table 1. Carrier Reference Levels.
Table 2. Intermodulation (IM) Analysis Measurements.

Exhibits Accompanying Report: Exhibit Group A, provides information specific to the antenna and filters used by *The FM Broadcast Group*. Exhibit Group B, includes an illustration showing basic layout of the combining units used to multiplex the seven FM stations and also a schematic representing the equipment used to isolate and measure potential intermodulation products and carrier reference levels.

Found within Table 1 are the carrier frequency measurements that provide relative output signal levels for the IM analysis. The IM Analysis Measurements, in Table 2, provides detailed information obtained from the product frequency investigation. Exhibit B - 3 lists the calculated third order products that can be generated from FM transmitters broadcasting from the multiplexed system.

The Nature Of Intermodulation Products (IM) : Intermodulation products result from inadequate transmitter-to-transmitter isolation. Intermodulation products are generated from FM radio stations operating into multiplexed facilities and from congested antenna broadcast sites. The mechanism that creates these unwanted products is well documented. When two or more transmitters are coupled to each other, new spectral components are produced by the mixing of the station frequencies within the power amplifiers 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 F_2 signifies the frequency causing the interference.

The Master FM Transmission System : Currently there are seven FM stations scheduled to operate from the Richland Tower Master FM Transmission System. The system has reserve capacity to accommodate additional stations however, there are no plans to expand the system beyond the current seven stations already installed. The Master FM Transmission System is fundamentally comprised of a broadband antenna, high power transmission line, and individual station combiner units. The Model COG-1083-10CP Antenna and Constant Impedance Type 963 combiner units are products of Electronics Research, Inc, and the Type 601-003 feed line, is manufactured by MYAT, Inc.
Additional information included with this report includes, a drawing titled ***"Feed System Detail"*** in Exhibit A-6 gives information pertaining to the dual transmission lines installed to feed the antenna.

To accomplish the aggregation of seven transmitter signals into a common antenna feed line and provide the required transmitter-to-transmitter isolation, a multiplexing system consisting of individual combiner modules were used. Specifically, six ERI 963-8 with Group Delay Compensation and one ERI 963-6 Constant Impedance combiner modules were installed at the site. The multiplexing arrangement is illustrated in the attached Exhibit A-3. The multiplexer, fully assembled, exhibited transmitter port-to-port isolation in excess of -55 dB. Other performance measurements, such as match, loss, group-delay, etc, revealed that the multiplexer units met all specification conditions set forth within the Combiner Specification Sheet included with this report (Refer to Exhibit A-4) .

IM Investigation : In order for the Master FM Antenna to broadcast an IM product it must first be generated within one of the station transmitters then couple into the multiplexing chain. The multiplexing arrangement is a series of individual combiner units therefore it is at the output of this chain that RF signals sampling is required to confirm that the multiplexed site is in FCC compliance.

Directional couplers are placed at key locations throughout the Master FM complex to monitor and maintain system performance. All couplers furnished with the system are factory calibrated and capable of delivering accurate and repeatable RF samples. To facilitate the taking of the measurements, the coupler located at the multiplexer output of the combined 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 include all filtering used to reduce broadcast emissions. The coupler selected would normally be used for antenna reflection measurements and thus would provide directivity greater than -30 dB (forward to reverse signal immunity and a -50dB coupling level).

The forward port of the coupler was used for sampling the outgoing carrier levels and IM products. The sampled signals was fed by shielded cable into a Band Pass Filter where all extraneous energy was steeply attenuated by the filters skirts. Attenuation pads were used on the Band Pass Filter and the Spectrum Analyzer to ensure an adequate signal level for measurements without overloading the measurement equipment and insure impedance matching. An IFR 2399A Spectrum Analyzer was employed to record the level of all signals investigated. To facilitate the selective tuning of the Band Pass Filter the Tracking Generator option built into the Spectrum analyzer was used. Also, the Spectrum Analyzer 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-2 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 emission measurements that any station using the Richland Tower site for full time broadcast operated at their licensed transmitter power. Therefore the normal circumstances under which stations operate are that KRBZ, KUDL, KYYS, KCMO, KQRC, and KCFX broadcast at 100 Kilowatts ERP and station KFME (using the facility as an auxiliary site) operated at 7.8 KW (TPO) for the duration of the IM measurements.

While operating normally and from the equipment setup described earlier 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 is essential in confirming that no significant levels of spurious energy, referenced to each carrier, were present from any transmitter operating from the multiplexed system.

Using the equipment previously described the IM product measurements were recorded and are listed in Table 2. The signal levels referenced to the carriers are calculated and listed in the column labeled " $\mathbf{G}^{\text{IM Level}}$ ". Refer to Exhibit B for a layout of the measurement equipment.

To demonstrate compliance with Sections (b) and (c) of the FCC Rules and Regulations, the emissions from each station's transmitter was observed using the forward RF sampling port from the Output Directional Coupler and the IFR Spectrum Analyzer.

The Spectrum Analyzer was set for a narrow, 600 Kilohertz sweep with averaging and maximum hold features enabled. Because frequency modulation with commercial programing was involved, time was allowed to "build" a composite signature from carrier excursions. With the aid of analyzers threshold limit-line, it could be seen that the spectral shape captured for each station's carrier conformed to regulatory specifications, within the accuracy of the measurement equipment.

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. The search covered the complete frequency span of the receiver and resulted in no additional investigations.

Conclusion : Based upon my observations and measurements taken May 4th 2003 as summarized in this document, I, Robert Rose, find the subject multiplexed system- specifically the transmitters and combiner system for the operation of the KCMO, KRBZ, KUDL, KQRC, KYYS, KCFX and KFME into the COG-1083-10CP 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 stations operating on the installed system. Also, based on this recorded data. I conclude that KCMO, KRBZ, KUDL, KQRC, KYYS, KCFX and KFME 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.

By ______________________________

Robert Rose
Vice President of Engineering

WARRICK COUNTY)
) SS:
STATE OF INDIANA)

AFFIDAVIT

I, Mark Steapleton, hereby declare that the following statements are true and correct to the best of my knowledge and belief :

1.) I am a Field Technician for Electronics Research, Inc ("ERI ") and have been employed by ERI for 22 years. I am familiar with and have assisted in the design, manufacturing and installation of FM Antennas and FM Multiplexers in my long tenure with ERI.

2.) I have either prepared all technical information contained in this Report Of Findings and to my knowledge to be accurate and true.

3.) ERI has been requested by Richland Tower, on behalf of radio stations KCMO, KRBZ, KUDL, KQRC, KYYS, KKFCX and KFME to prepare this Report Of Findings.

Mark Steapleton

Mark Steapleton; Field Technician

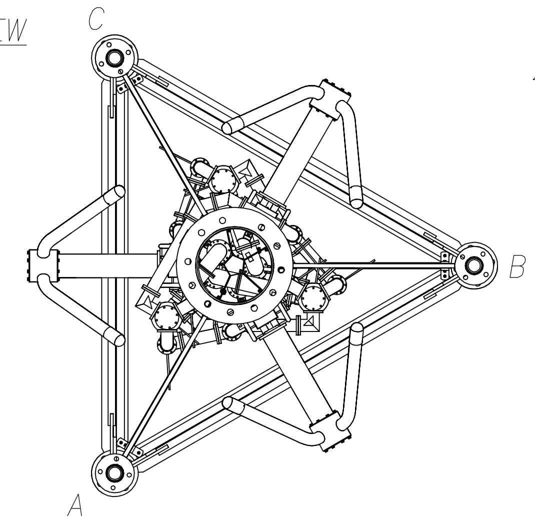
Subscribed and sworn to before me on this 28th. day of May 2003.

Jacquelyn S Kinney

Jacquelyn Kinney; Notary Public
My commission expires July 3, 2007

NOTARY PUBLIC SEAL INDIANA

TOP VIEW

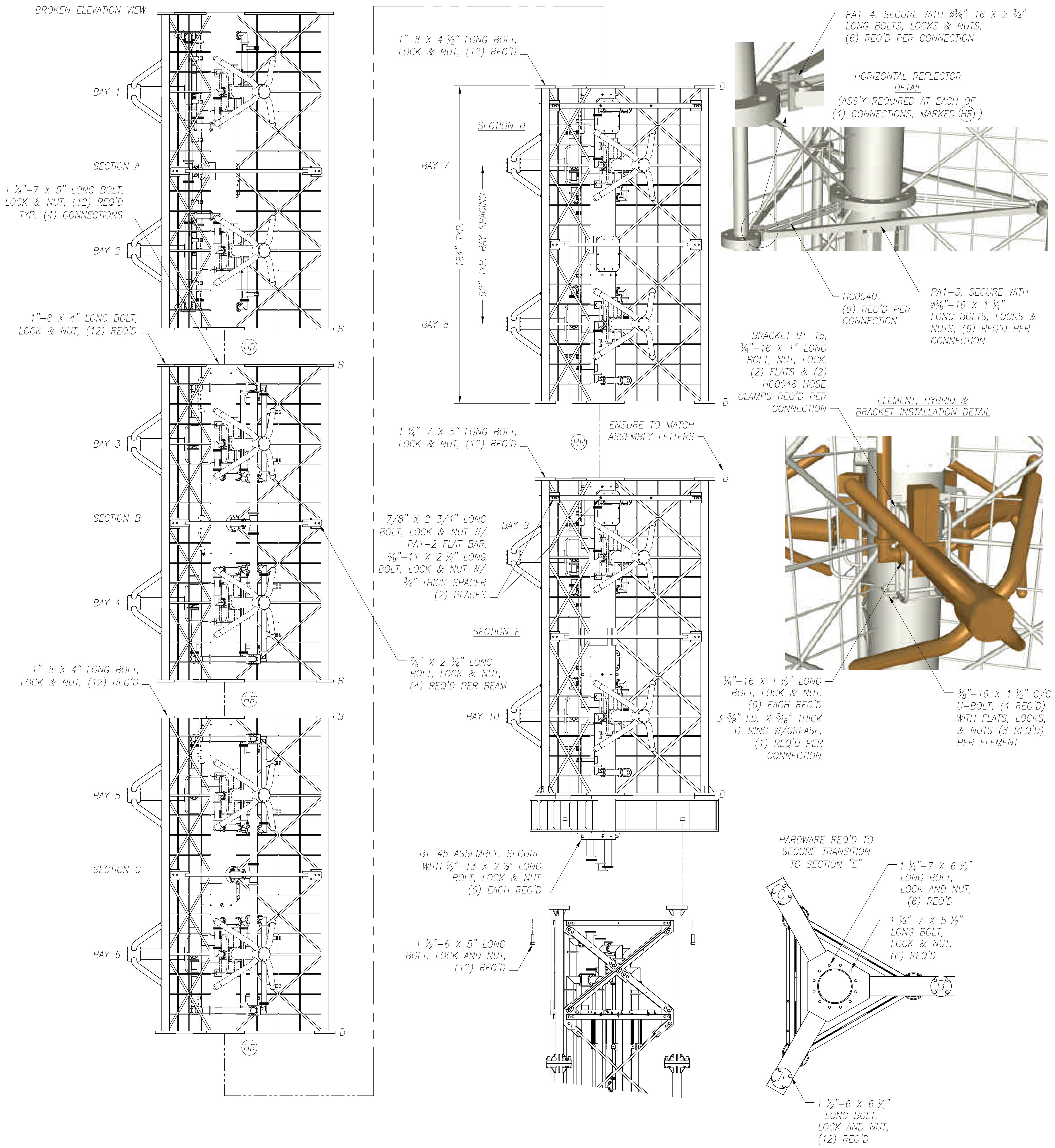


NOTES: 1) THE (10) ELEMENT/HYBRID ASSEMBLIES THAT MUST BE INSTALLED ARE SHOWN WITH PHANTOM LINES BELOW. THE HYBRID FLANGES, AS WELL AS THE FLANGES ON THE ELBOWS IN WHICH THEY CONNECT ARE NUMBERED, EX. 1,A,1, 2,B,1, ETC. MATCH NUMBERS FOR PLACEMENT. (SEE FEED HARNESS DETAIL & NUMBERING SCHEME, IC-2 FOR FULL DETAIL)

2) SUGGESTED INSTALLMENT PROCEDURE:

1. PREP COGWHEEL FOR INSTALLATION: INSTALL MISSING ELEMENTS (SEE ELEMENT/HYBRID AND BRACKET INSTALLATION DETAIL), REMOVE SHIPPING PACKAGING, ATTACH CENTERFEED ELBOWS AND STUB SECTIONS TO TEE (SEE DETAIL 3 ON RIGHT) AND PLACE SPRING HANGER SADDLES IN CORRECT LOCATION (SEE SADDLE PLACEMENT ON RIGHT).
2. SET TRANSITION ASSEMBLY ON PROVIDED STANDS (ON GROUND). ENSURE THAT (FOR PICKING ORIENTATION PURPOSES) LADDER BRACKET ON TRANSITION IS ON THE SAME FACE AS THE EXISTING LADDER.
3. HOIST SECTIONS "E" & "D" UP AND VERY CAREFULLY BOLT TO TRANSITION. ENSURE THAT LETTERS A,B,&C ON COG SECTION LEGS MATCH THOSE ON THE TRANSITION SECTION.
4. RAISE SECTIONS JUST ABOVE TOWER & ALIGN CORRECTLY.
5. LOWER VERY CAREFULLY ONTO THE TOWER SECTION AND SECURE.
6. INSTALL PIPE W/FLANGE MARKED BT-45, ALONG WITH STAR CONFIGURATION AND TEFLON ALIGNMENT PINS AS SHOWN AT BOTTOM OF SECTION "E".
7. ENSURE THAT LINES ARE ADJUSTED TO PROTRUDE OUT OF THE PIPE AS DIMENSIONED IN DETAIL BELOW BY LOOSENING HOSE CLAMPS ON SPRING HANGERS AND (2) RIGID LINE BRACKETS. LINE SECTIONS ARE ALIGNED WITH TEFLON PINS IN STAR CONFIGURATIONS. (SEE DETAIL 1 ON RIGHT)
8. WHILE ON THE GROUND, ATTACH SECTIONS "B"&"C" TO SECTION "A" AND PREP FOR INSTALLATION (SEE NOTE 1).
9. HOIST SECTIONS "B","C"&"A" JUST ABOVE SECTION "D" AND ENSURE TO ALIGN LETTERS A,B,&C ON COG SECTION LEGS.
10. LOWER VERY CAREFULLY ONTO SECTION "D" AND SECURE.
11. ADJUST LINES TO MATCH WITH THOSE ON SECTION "D" BY LOOSENING HOSE CLAMPS ON SPRING HANGERS AND (3) RIGID LINE BRACKETS. ENSURE THAT LINE TENSION IS HANGING EVENLY FROM SPRINGS, IT IS IMPORTANT TO MAINTAIN PROTRUSION DIMENSIONS ON LINES AS SECTIONS ARE ADDED.
12. ENSURE TO INSTALL MISSING HORIZONTAL TIE BEAMS, STAINLESS HORIZONTALS AND HOSE CLAMPS (SHOWN BELOW), FIBERGLASS ANGLES SECURE ONLY TO THE TOP OF SECTIONS "E"&"D".

BROKEN ELEVATION VIEW



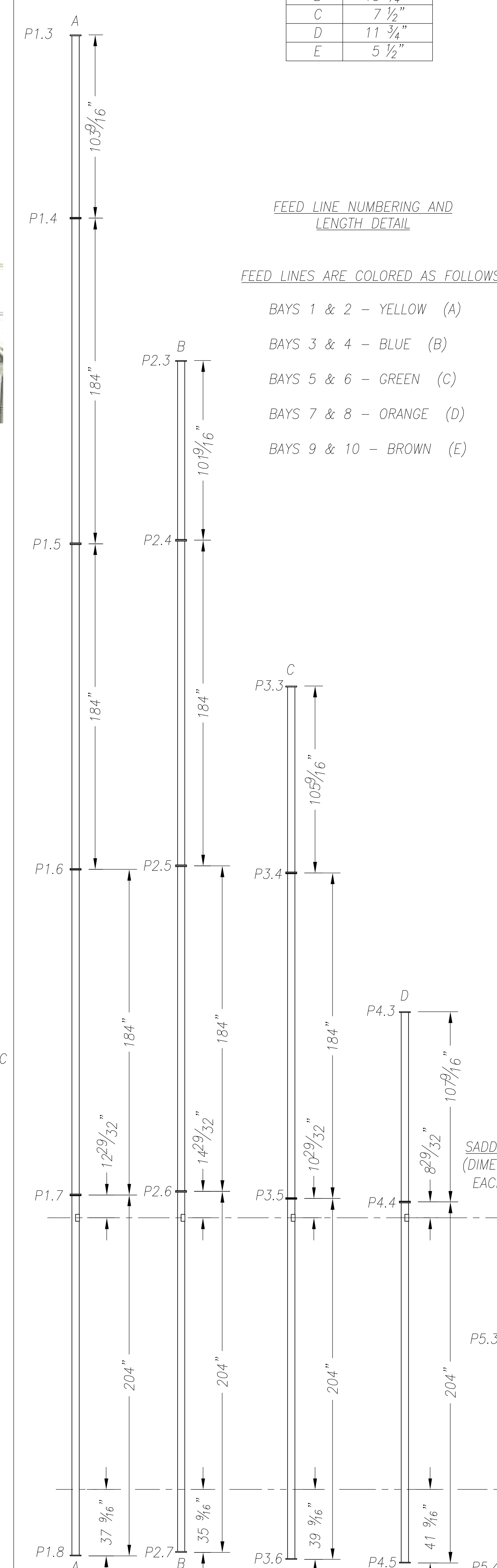
NOTES:
1) PARTS ARE STAMPED FOR ASSEMBLY PURPOSES.
2) RIGID LINE BRACKETS (BT-29 & BT-30) ARE USED DIRECTLY AND EXCLUSIVELY ON LINES THAT ROUTE THROUGH CENTERFEED ENTRANCE PORTS AS SHOWN IN DETAIL 3 AND IN RED ON DETAIL (1).
3) POLE WALL THICKNESS CHANGES FROM ½" ON THE LOWER (3) SECTIONS TO ⅜" ON THE TOP (2) SECTIONS, ENSURE TO USE BRACKET BT-30 ON THE LOWER (3) SECTIONS AND BRACKET BT-29 ON THE UPPER (2) SECTIONS.
IN ADDITION, THERE ARE (2) SIZES OF STAR CONFIGURATIONS. USE BT-24 BRACKETS ON LOWER (3) SECTIONS AND BT-27 BRACKETS ON THE UPPER (2) SECTIONS.
4) SPRING HANGERS ARE PLACED ONLY AT THE TOP OF EACH SECTION AS SHOWN IN DETAIL 2.

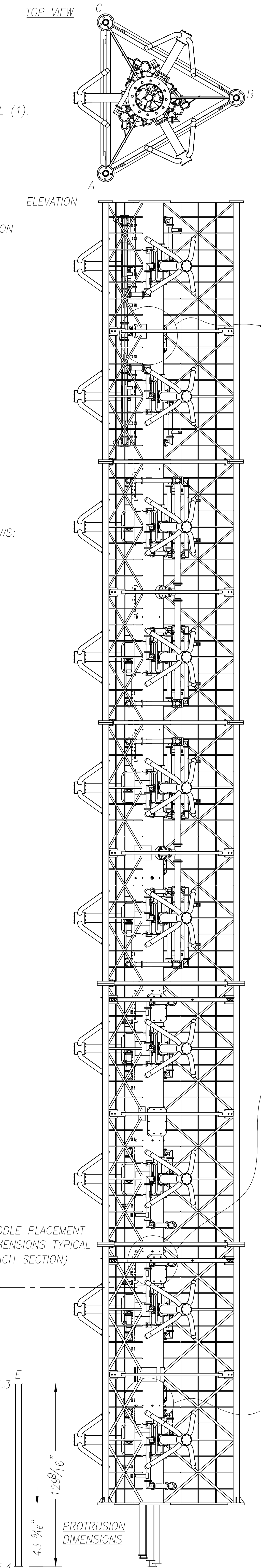
SECTION	LINE LENGTH
A	9 ¾"
B	13 ¾"
C	7 ½"
D	11 ¾"
E	5 ½"

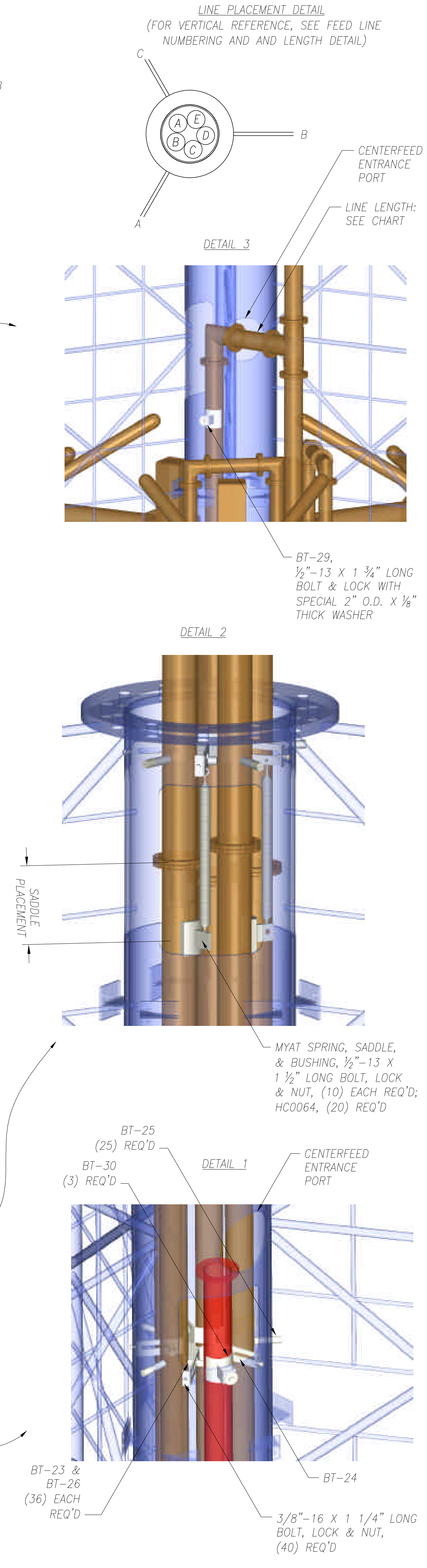
FEED LINE NUMBERING AND LENGTH DETAIL

FEED LINES ARE COLORED AS FOLLOWS:

BAYS 1 & 2 – YELLOW (A)
BAYS 3 & 4 – BLUE (B)
BAYS 5 & 6 – GREEN (C)
BAYS 7 & 8 – ORANGE (D)
BAYS 9 & 10 – BROWN (E)







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NO	REVISION	APP'D	DATE
6			
5			
4			
3			
2			
1			

NAME SECTION INSTALLATION/LINE DETAILS
STATION: 09574–KANSAS CITY,MO
FREQUENCY: N/A PROJECT NO.: 09574
PATH G:\DRAFTING\ALL\PROJECTS\09574
FILE IC–4 DRAWN B.L.V. FACTOR NTS
DATE 12/3/02 APP'D DWG. NO.
MODEL COG3-20P-10-140-2 IC–4

A-2 ERI Antenna Specification Sheet

KANSAS CITY , MISSOURI

General Specifications

Antenna Type . . . . High Power FM-Broadcast, Suitable For Multiplexing
Model Number COG-1083-10CP
Number Of Bay Levels . . . . Ten
Polarization . . . . Right Hand Circular

Electrical Specifications

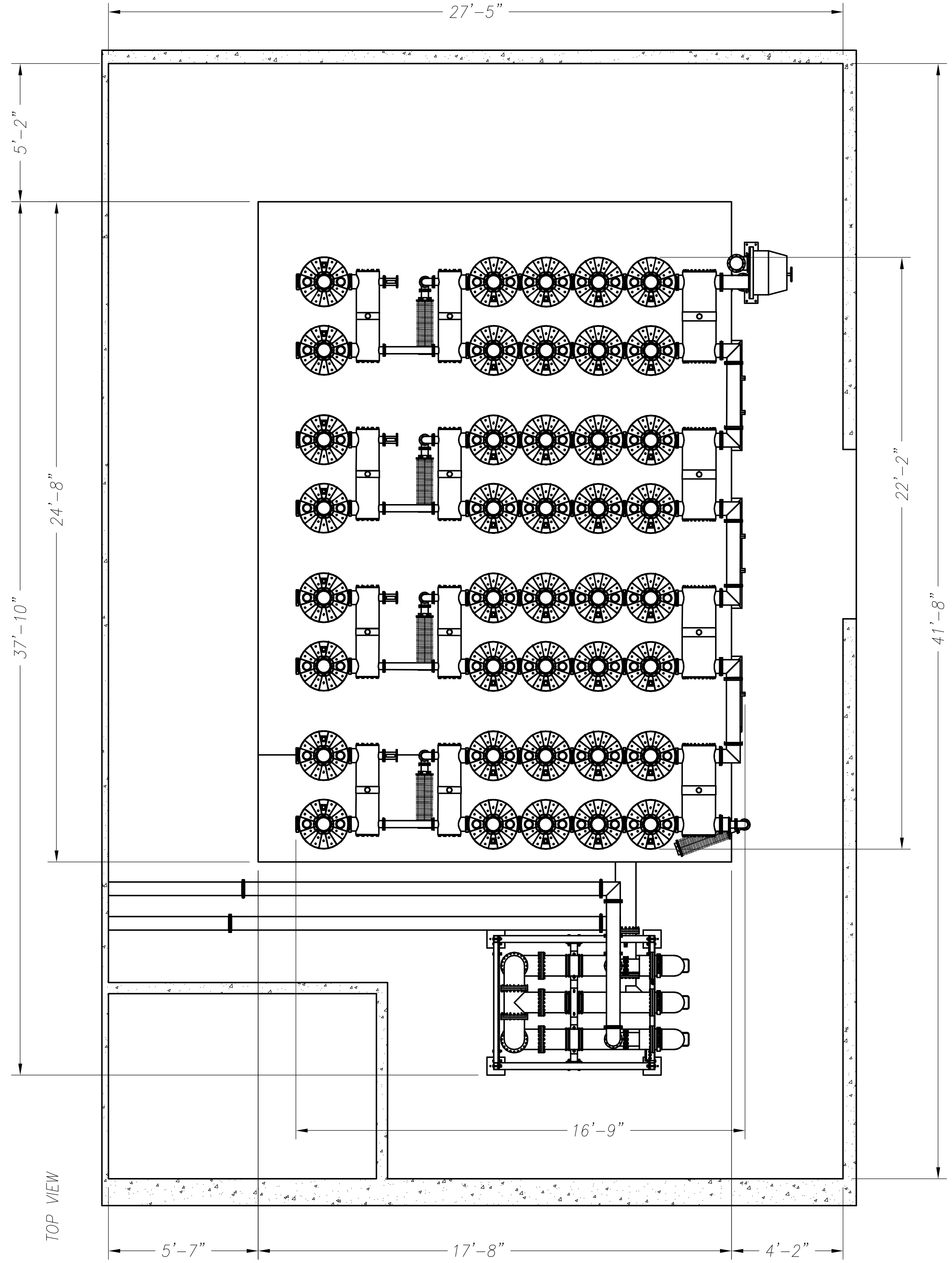
Antenna Input Power Capability (Designed) . . . . 250 KW. Maximum (1)
Operating Frequency Band . . . . All FM Frequencies
VSWR . . . . 1.15 : 1 (2)
Azimuthal Pattern Circularity . . . . +/- 2dB From RMS (Free Space)
Power Split . . . . 50/50 (Horizontal & Vertical)
Quarter Wave Shorting Stub . . . . NA
Frequency Specific Information:

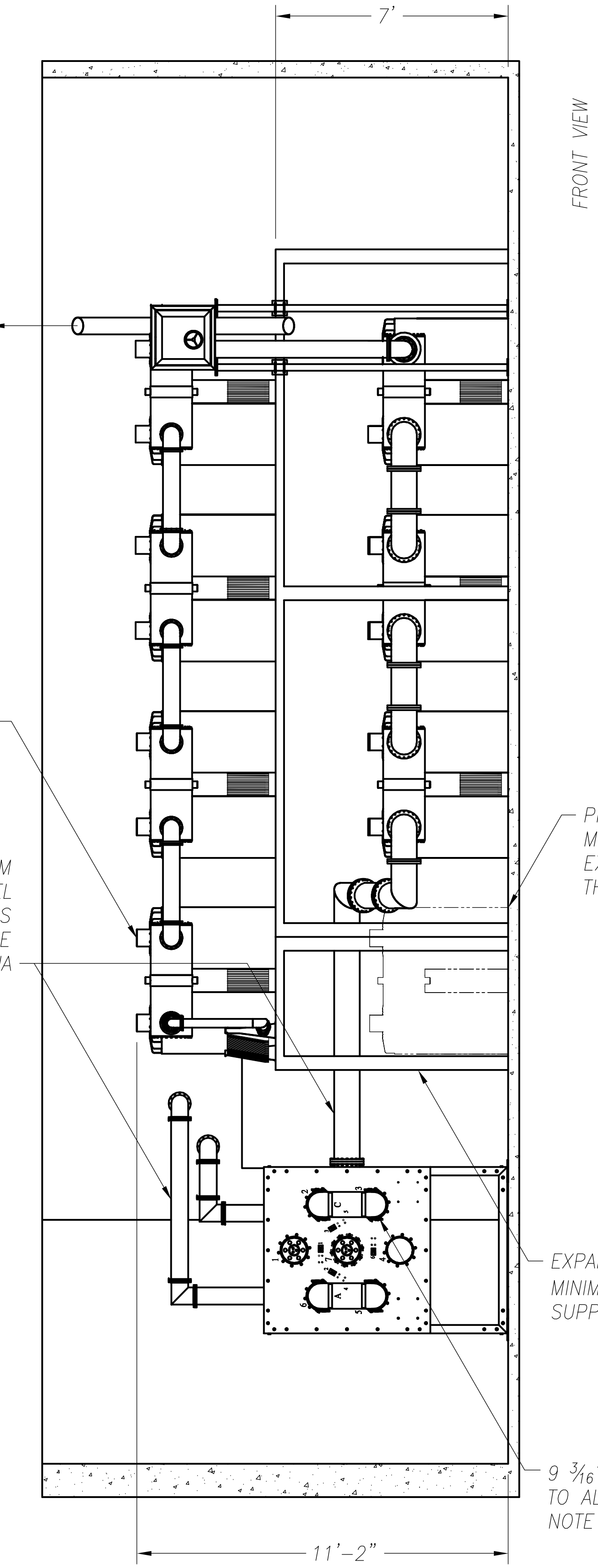
Frequency	Station ERP	Beam Tilt	First Null Fill	Second Null Fill	Power Gain (MAXIMUM)	Line Loss (3)	Filter Loss (4)	Computed TPO (5)
94.9	**40 (KW)**	**-0.75°**	**10 %**	**5%**	**4.223**	**.567 dB**	**.563 dB**	**12.29 (KW)**
96.5	**100 (KW)**	**-0.75°**	**10 %**	**5%**	**4.286**	**.572 dB**	**.483 dB**	**29.75 (KW)**
98.1	**100 (KW)**	**-0.75°**	**10 %**	**5%**	**4.350**	**.576 dB**	**.537 dB**	**29.71 (KW)**
98.9	**100 (KW)**	**-0.76°**	**10 %**	**5%**	**4.381**	**.579 dB**	**.559 dB**	**29.66 (KW)**
99.7	**100 (KW)**	**-0.76 °**	**10 %**	**5 %**	**4.412**	**.581 dB**	**.610 dB**	**29.82 (KW)**
101.1	**100 (KW)**	**-0.76°**	**10 %**	**5%**	**4.467**	**.586 dB**	**.552 dB**	**29.09(KW)**
105.1	**29 (KW)**	**-0.76°**	**10 %**	**5 %**	**4.621**	**.597 dB**	**.140 dB**	**7.44 (KW)**

Mechanical Specifications

Antenna Feed System . . . . Fed With Dual Feed Lines
Input Connectors . . . . 6-1/8" 50- Ohm EIA Flanged
Element Deicing . . . . Not Ordered (6)
Interbay Spacing . . . . 92.00 Inch Center to Center
Array Length . . . . 119.6 Feet
Construction Material (Antenna) . . . . All Noncorrosive
Construction Material (Mounting) . . . . Galvanized Plated Steal and All Stainless Steel
Mounting . . . . Integral Arrangement (Antenna Preassembled To Mast)

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 1202 Feet, Myat Type 601 Rigid 6 1/8" Coax.
4) Losses Taken From Actual Multiplexer Measurements Taken At The Factory.
5) TPO Calculations Are Figured As Combiner Input Power.
6) With Low Q Element Design, Moderate Icing Will Not Cause Appreciable VSWR Rise.





NOTE*:
TO MINIMIZE MODIFICATIONS TO CURRENT LINE ROUTINGS, PATCH PANEL OUTPUT PORTS WILL NEED TO BE REDESIGNATED.

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NO	REVISION	APP'D	DATE
6			
5			
4			
3			
2			
1			

NAME PROPOSED SYSTEM EXPANSION
STATION: KANSAS CITY, MO.
FREQUENCY: N/A PROJECT NO.: 09574/13
PATH G:\DRAFTING\ALL\PROJECTS\09574\13
FILE QM-4 DRAWN BAM FACTOR NTS
DATE 3/1/03 APP'D DWG. NO.
MODEL NON-APPLICABLE QM-4

<u>A-4 ERI Combiner Specification Sheet</u>

KANSAS CITY , MISSOURI

General Specifications:

Multiplexer Type . . . . 963 Constant Impedance Combiner
Number Of Combining Units . . . . Seven
Injected Port to Injected Port Isolation . . . . < - 55 dB
Output Connector . . . . 9 3/16 " 50 Ohm EIA (Flanged)
Output Power . . . . 250 KW
Combiner Units, Size and Weight :

Type 963-8GD Tuned To 94.9 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-8GD Tuned To 96.5 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-8GD Tuned To 98.1 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-8GD Tuned To 98.9 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-8GD Tuned To 99.7 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-8GD Tuned To 101.1 MHz . . . . 58" ht. X 4.5' wd. X 17' lng. & 2,000 Lbs.
Type 963-6 Tuned To 105.1 MHz . . . . 58" ht. X 4.5' wd. X 157' lng. & 1,630 Lbs.

Heat Removal (Multiplexer Module) . . . . Natural Convection
Heat Removal (Group Delay Modules) . . . . Forced Air
Physical Arrangement . . . . All Components Floor and Mezzanine Standing Upright

Injected Port Specifications:

Frequency Assignment (From Antenna Output) . 105.1 / 101.1 / 94.9 / 96.5 / 98.1/ 98.9 And 99.7 MHz.
Power Rating, Each Injected Port (Maximum) . . . . 31 KW
Input Connector . . . . 3-1/8" 50 Ohm EIA (Flanged)
VSWR . . . . Less than 1.08:1 @ +/-150 KHz(1)
Group Delay . . . . Less than 60 ns Overall Variation, Carrier @ +/- 150 KHz
Insertion Loss (Measured):

94.9 MHz. . . . . - 0.567 dB
96.5 MHz. . . . . - 0.572 dB
98.1 MHz. . . . . - 0.576 dB
99.7 MHz . . . . -0.610 dB
98.9 MHz. . . . . - 0.579 dB
101.1 MHz. . . . . - 0.586 dB
105.1 MHz. . . . . - 0.140 dB

1) When Terminated in 50 Ohm Resistive Load.

ELECTRONICS RESEARCH, INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 1

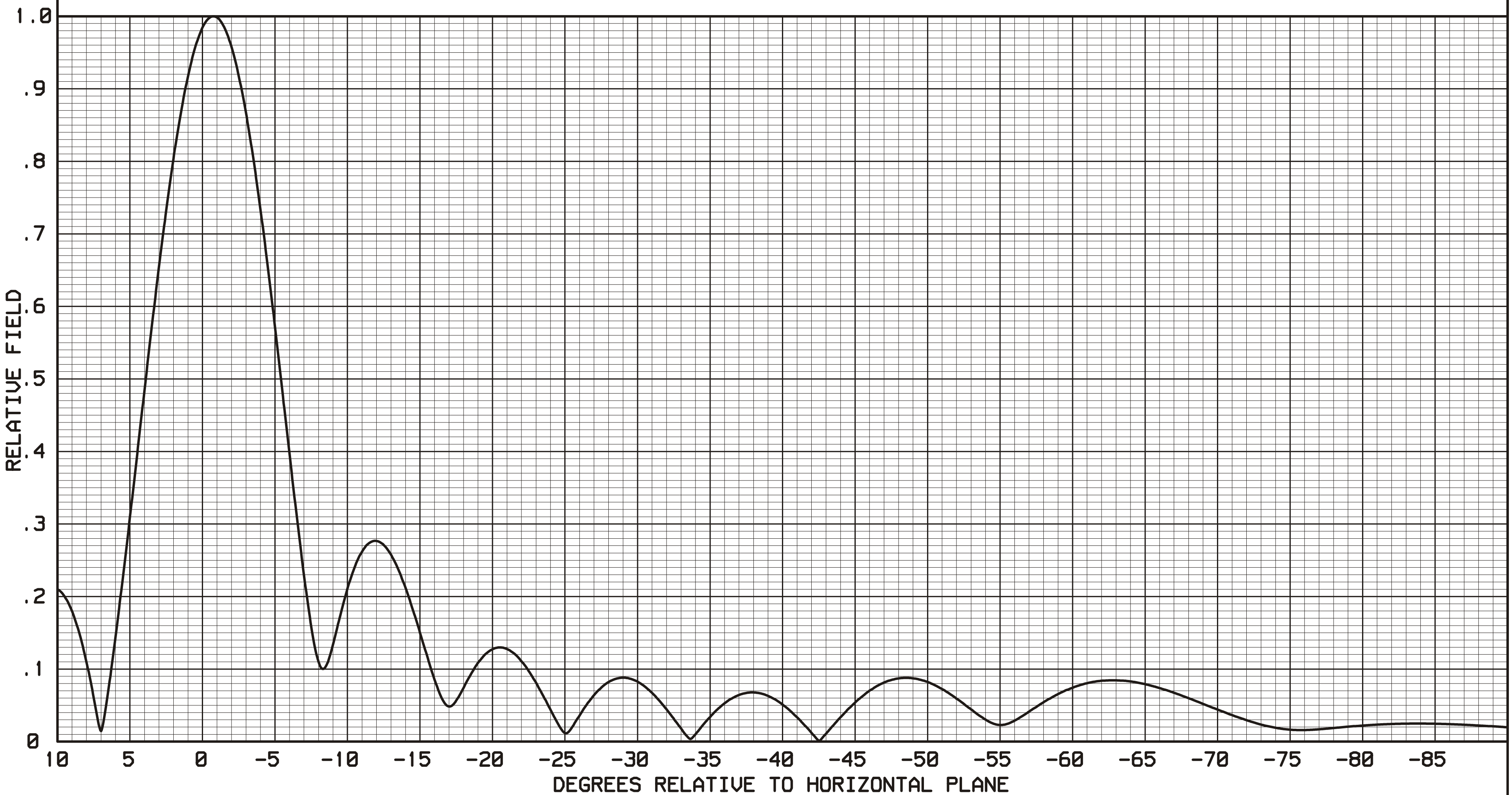
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

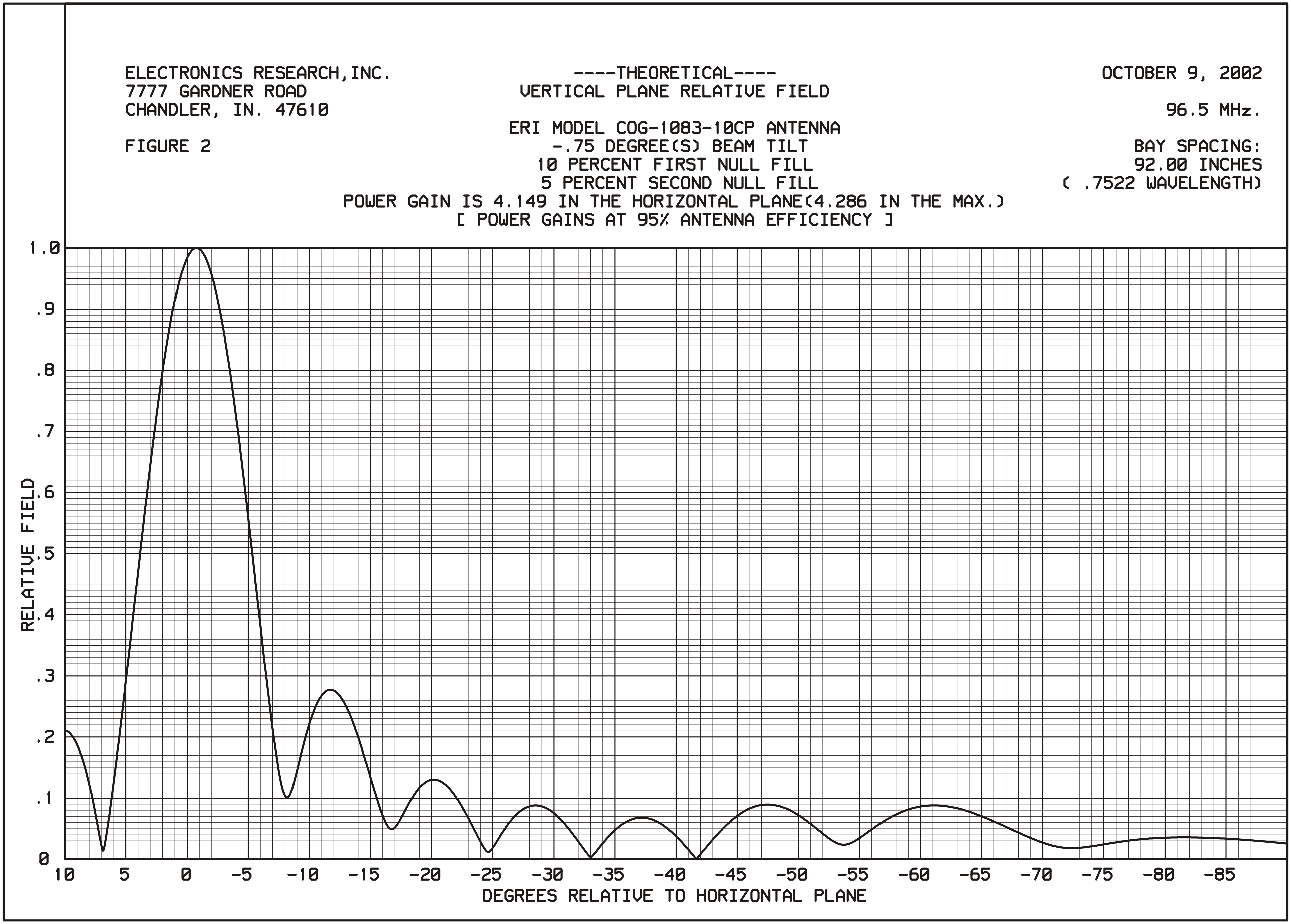
ERI MODEL COG-1083-10CP ANTENNA
-.75 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.092 IN THE HORIZONTAL PLANE(4.223 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

OCTOBER 9, 2002

94.9 MHz.

BAY SPACING:
92.00 INCHES
(.7397 WAVELENGTH)




ELECTRONICS RESEARCH, INC.
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CHANDLER, IN. 47610
FIGURE 2
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
ERI MODEL COG-1083-10CP ANTENNA
-.75 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.149 IN THE HORIZONTAL PLANE(4.286 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]
OCTOBER 9, 2002
96.5 MHz.
BAY SPACING:
92.00 INCHES
(.7522 WAVELENGTH)
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.
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CHANDLER, IN. 47610

FIGURE 2A

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI MODEL COG-1083-10CP ANTENNA
-.75 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.205 IN THE HORIZONTAL PLANE(4.350 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

MARCH 4, 2003

98.1 MHz.

BAY SPACING:
92.00 INCHES
(.7647 WAVELENGTH)

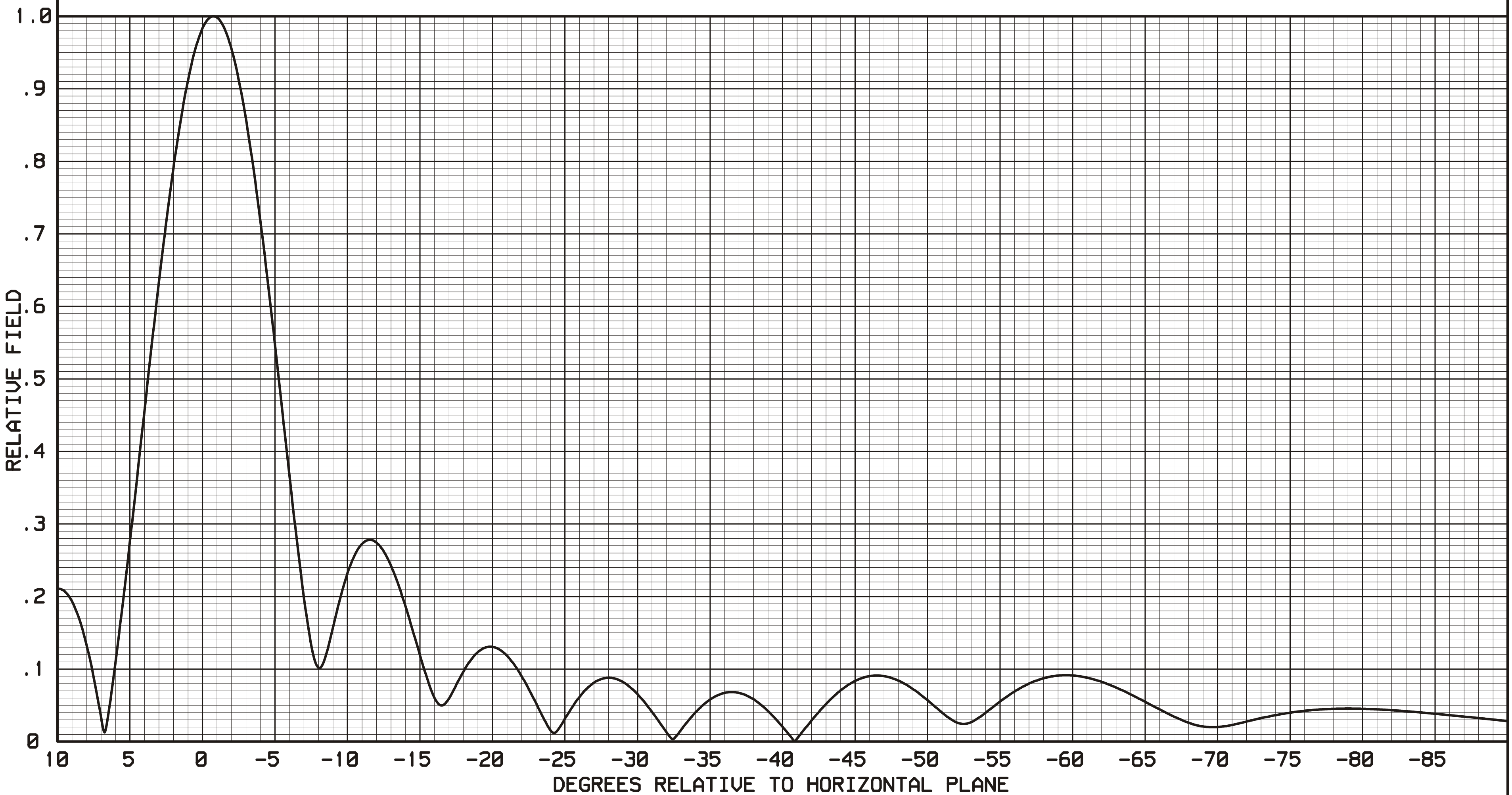

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FIGURE 3

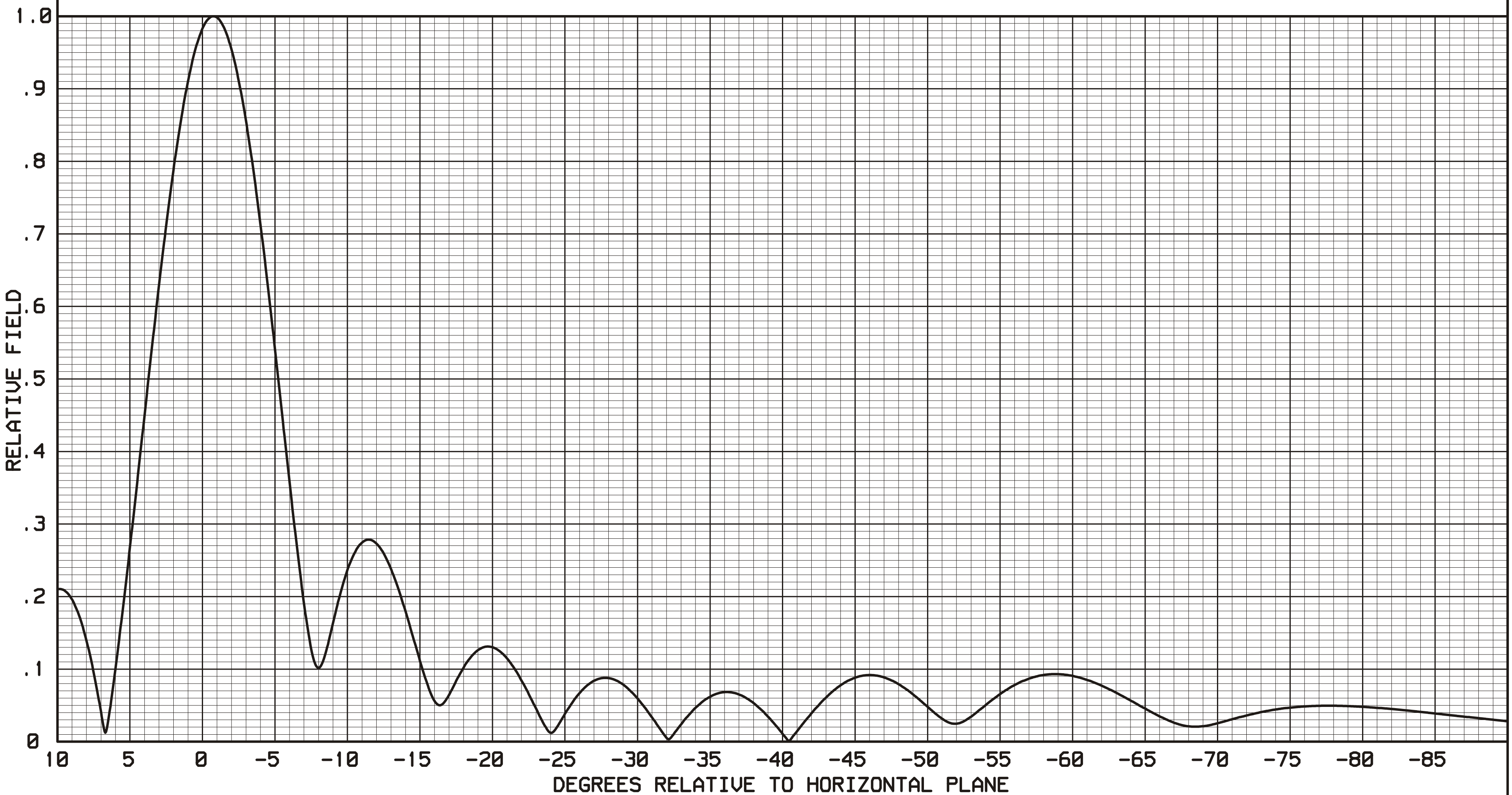
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI MODEL COG-1083-10CP ANTENNA
-.76 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.233 IN THE HORIZONTAL PLANE(4.381 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

OCTOBER 9, 2002

98.9 MHz.

BAY SPACING:
92.00 INCHES
(.7709 WAVELENGTH)



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CHANDLER, IN. 47610

FIGURE 4

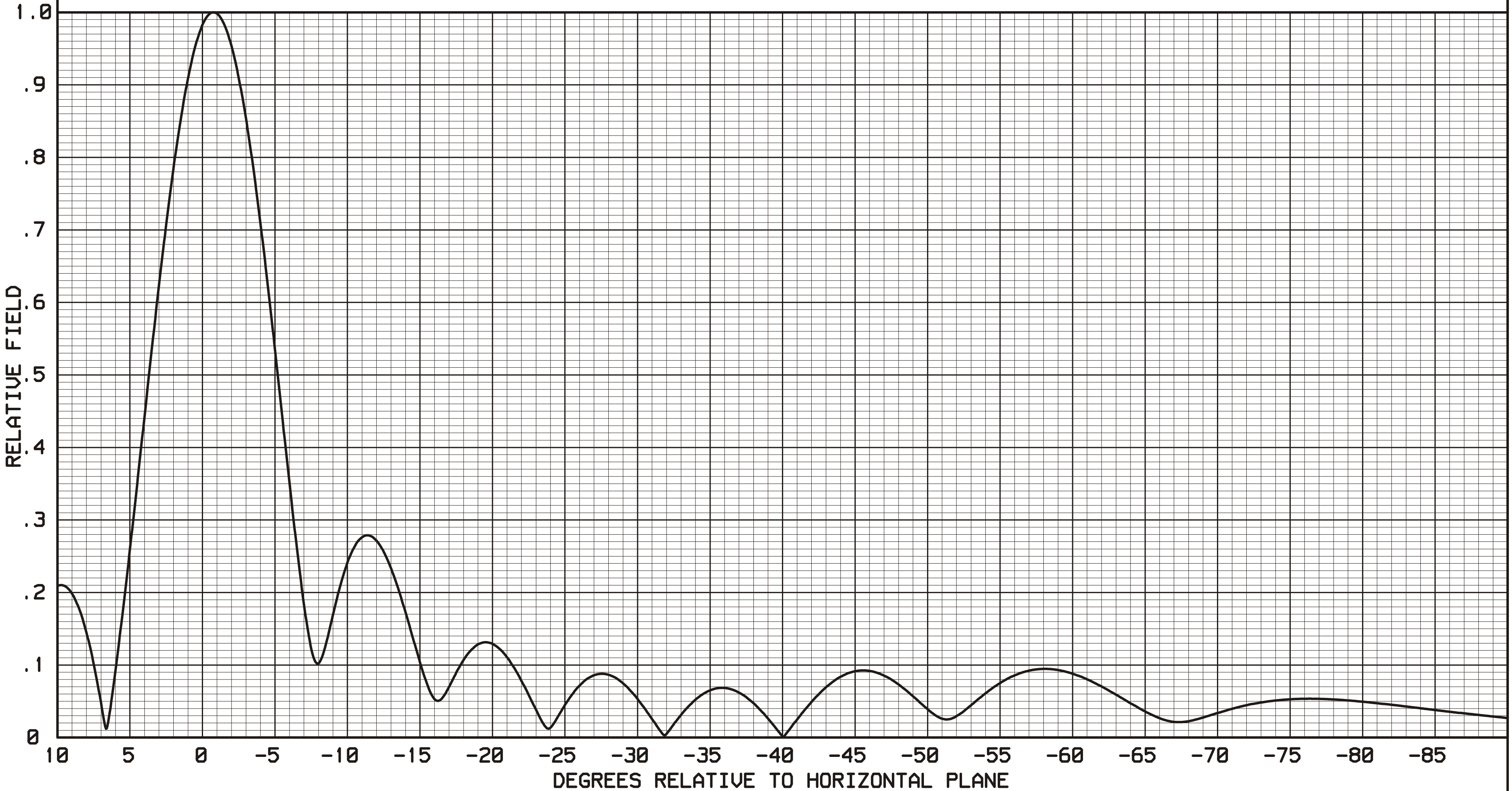
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI MODEL COG-1083-10CP ANTENNA
-.76 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.261 IN THE HORIZONTAL PLANE(4.412 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

OCTOBER 9, 2002

99.7 MHz.

BAY SPACING:
92.00 INCHES
(.7771 WAVELENGTH)



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CHANDLER, IN. 47610

FIGURE 5

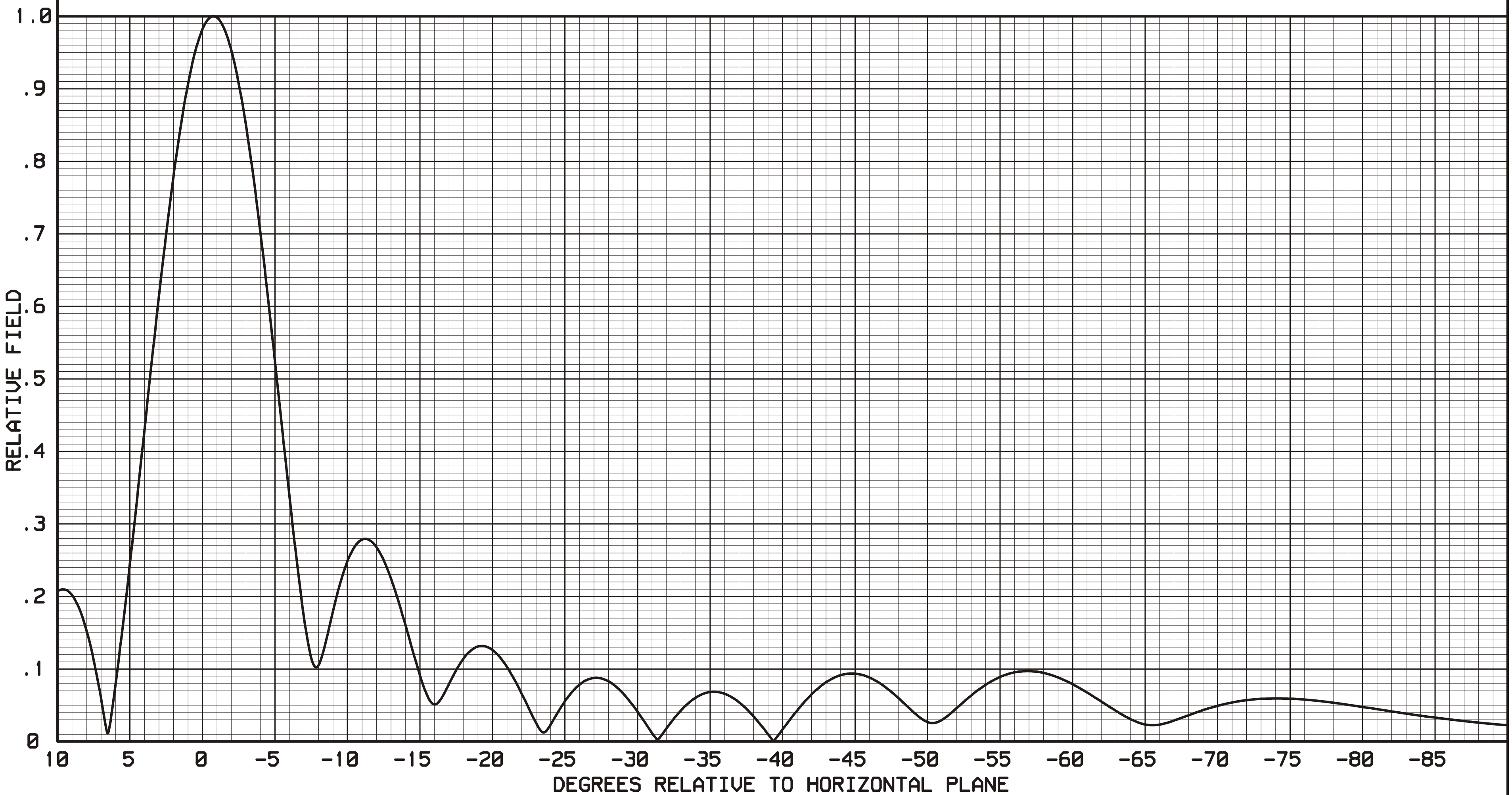
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI MODEL COG-1083-10CP ANTENNA
-.76 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.309 IN THE HORIZONTAL PLANE(4.467 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

OCTOBER 9, 2002

101.1 MHz.

BAY SPACING:
92.00 INCHES
(.7880 WAVELENGTH)



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CHANDLER, IN. 47610

FIGURE 6

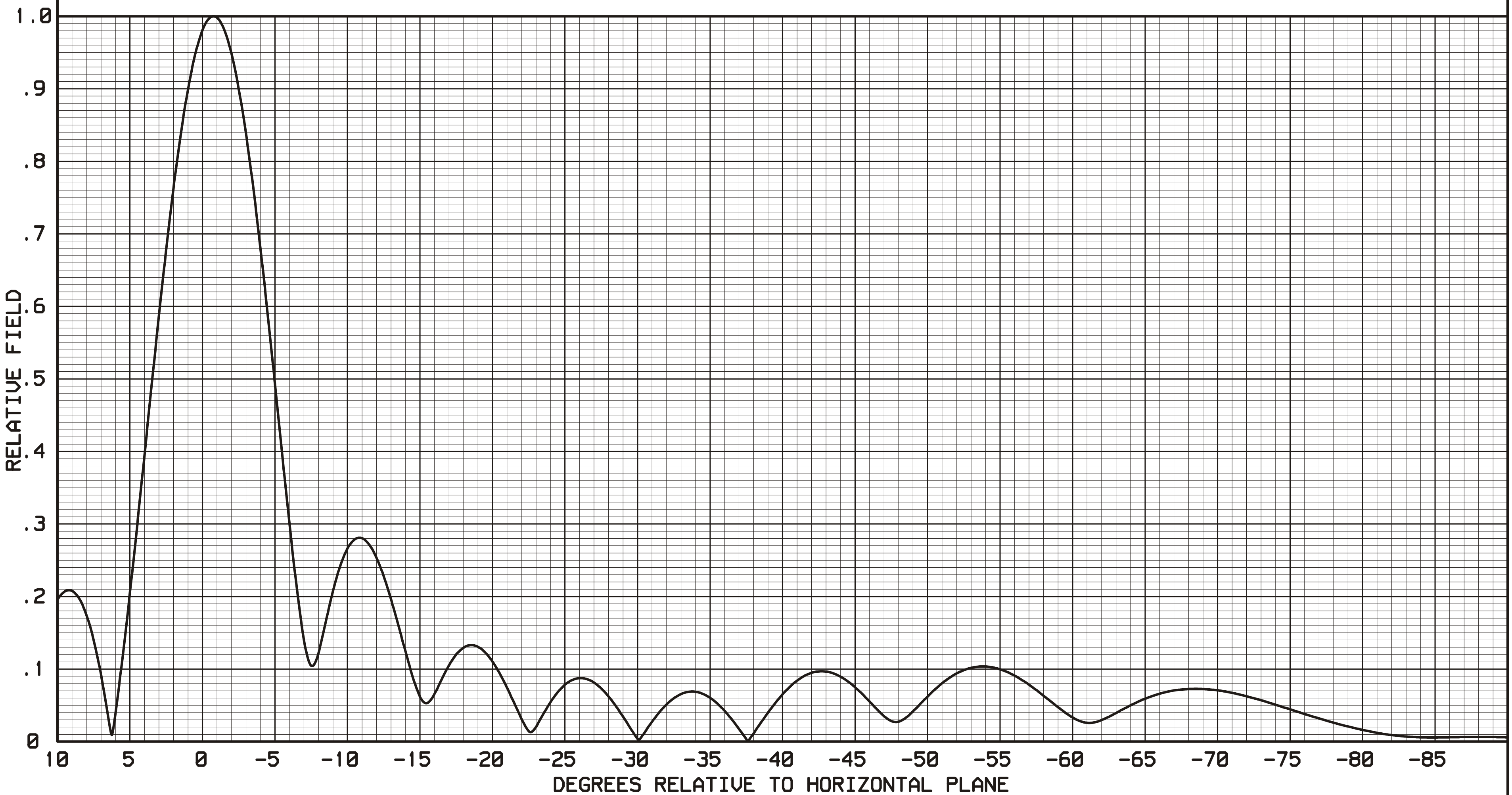
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI MODEL COG-1083-10CP ANTENNA
-.76 DEGREE(S) BEAM TILT
10 PERCENT FIRST NULL FILL
5 PERCENT SECOND NULL FILL
POWER GAIN IS 4.445 IN THE HORIZONTAL PLANE(4.621 IN THE MAX.)
[POWER GAINS AT 95% ANTENNA EFFICIENCY]

OCTOBER 9, 2002

105.1 MHz.

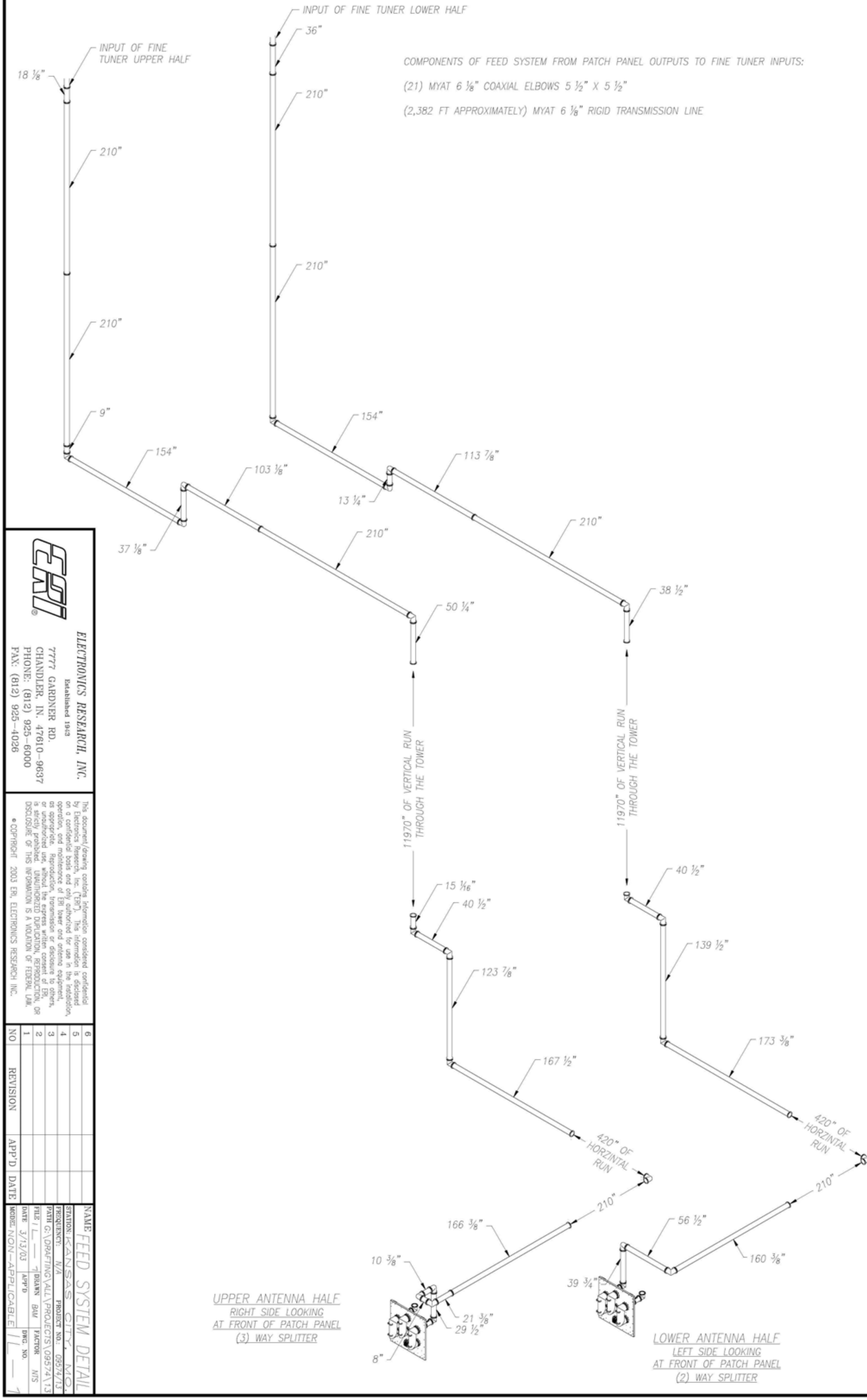
BAY SPACING:
92.00 INCHES
(.8192 WAVELENGTH)



COMPONENTS OF FEED SYSTEM FROM PATCH PANEL OUTPUTS TO FINE TUNER INPUTS:

(21) MYAT 6 ⅛" COAXIAL ELBOWS 5 ½" X 5 ½"

(2,382 FT APPROXIMATELY) MYAT 6 ⅛" RIGID TRANSMISSION LINE



ERI®

ELECTRONICS RESEARCH, INC.
Established 1943
7777 GARDNER RD.
CHANDLER, IN. 47610-9637
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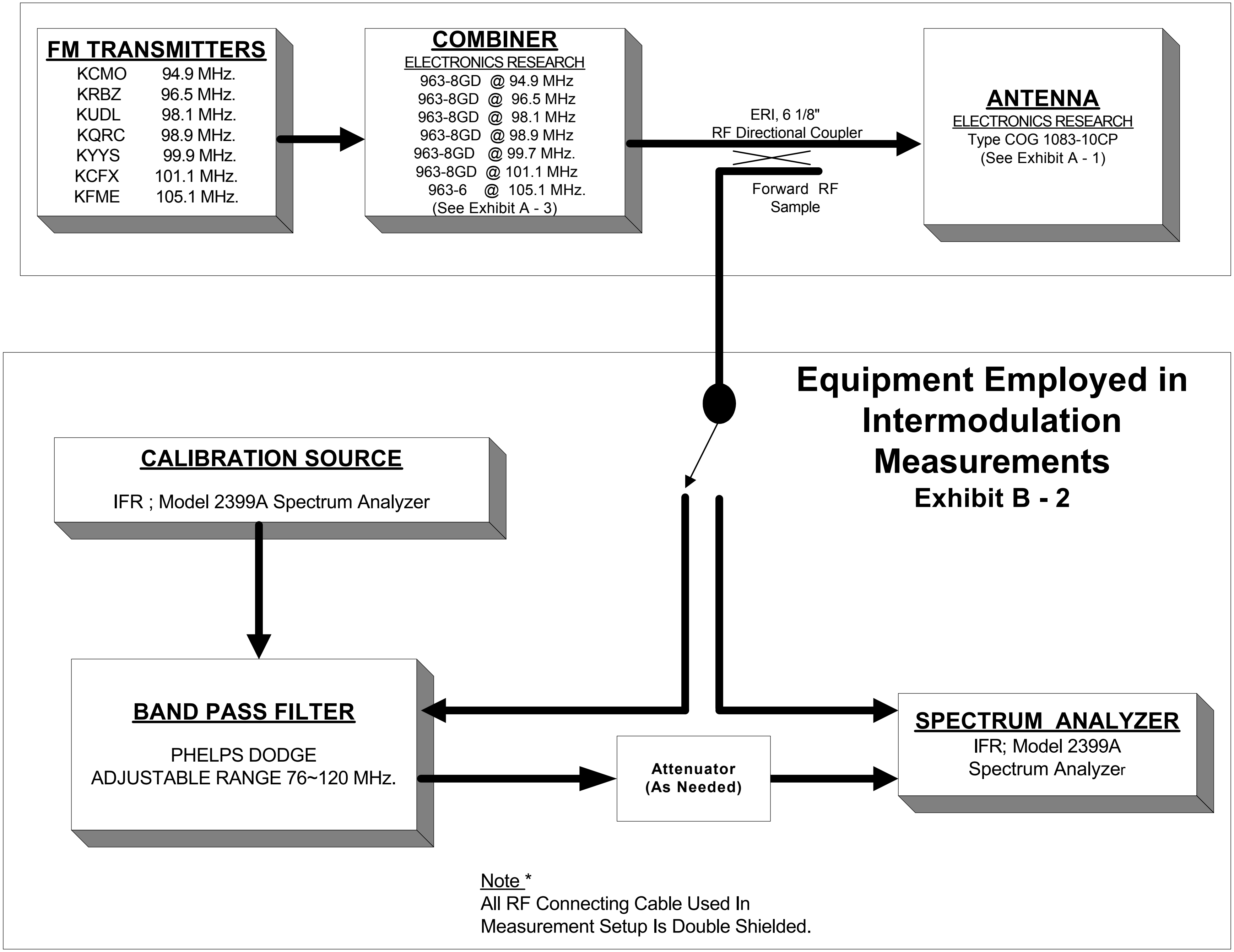
FAX: (812) 925-4026

NO	REVISION	APP'D	DATE
1			
2			
3			
4			
5			
6			

NAME: FEED SYSTEM DETAIL
STATION: KANSAS CITY, MO.
FREQUENCY: N/A | PROJECT NO. 09574\13
PATH: G:\DRAFTING\ALL\PROJECTS\09574\13
FILE: IL—1 | DRAWN: BAM | FACTOR: NTS
DATE: 3/13/03 | APP'D: | DWG. NO. IL—1
MODEL: NON-APPLICABLE

KCMO ~ KRBZ ~ KUDL ~ KQRC ~ KYYS ~KCFX ~ KFME

Broadcasting Scheme EXHIBIT - B1



Broadcasting Scheme and Equipment Employed in Intermodulation Measurements

EXHIBIT B

Exhibit B - 3 Third Order Products Expected.

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 below.

	Carrier Frequency (MHz)						
Interfering Frequency (MHz)	**KCMO 94.9**	**KRBZ 96.5**	**KUDL 98.1**	**KQRC 98.9**	**KYYS 99.7**	**KCFX 101.1**	**KFME 105.1**
KCMO 94.9	---	98.1	101.3	102.9	104.5	107.3	115.3
KRBZ 96.5	93.3	---	99.7	101.3	102.9	105.7	113.7
KUDL 98.1	91.7	94.9	---	99.7	101.3	104.1	112.1
KQRC 98.9	90.9	94.1	97.3	---	100.5	103.3	111.3
KYYS 99.7	90.1	93.3	96.5	98.1	---	102.5	110.5
KCFX 101.1	88.7	91.9	95.1	96.7	98.3	---	109.1
KFME 105.1	84.7	87.9	91.1	92.7	94.3	97.1	---

Table 1.

Carrier Reference Levels

Carrier Frequency (MHz)	Pad One (dB)	Bandpass Filter Loss (dB)	Measured Level (dBm)	**Adjusted Level (dBm)**	Notes
KCMO (94.9)	10	---	5.64	**15.64**	
KRBZ (96.5)	10	---	7.79	**17.79**	
KUDL (98.1)	10	---	7.84	**17.84**	
KQRC (98.9)	10	---	7.90	**17.90**	
KYYS (99.7)	10	---	7.68	**17.68**	
KCFX (101.1)	10	---	6.20	**16.20**	
KFME (105.1)	10	---	-2.83	**7.17**	

The table above list the seven (7) current users of the Richland Tower FM Master Antenna System. The data in the table was obtained from the directional coupler located between the antenna patching complex and the multiplexer output. The data was taken with each ststion operating at their transmitter at 100% of the licensed output power. The directional coupler wa configured to provide a forward level sample, the same setup method to measure all IM products.

The measured levels taken from the Spectrum Analyzer includ the attenuation effects of external bandpass filters and signal padding. The use of external pads maintains a good impedance match between test measurement equipment. Employing a tuned bandpass filter prevents the Spectrum Analyzer from saturation and prevents potential damage from the presence of strong multistation signals. The adjusted levels are computed with measurement losses removed. These figures serve as reference levels in this report.

Intermodulation (IM) Analysis Measurements
Richland Tower Master Antenna, Kansas City, Missouri

Table 2

A Frequency Of Product Possibility	B Spectrum Analyzer Measured Level	C Measurement Loss Pad + Band-pass Filter	D Level Adjusted For Measurement Losses	E Associated Station Frequency	F Normalized Reference Level	G IM Level (Deference Between D And F)
(1) 84.7 MHz	-101.1 dBm	-13.25 dBm	-87.85 dBm	94.9 MHz	15.64 dBm	-103.49 dBm
(2) 86.5 MHz (1)	-101.3 dBm	-13.10 dBm	-88.20 dBm	94.9 MHz	15.64 dBm	-103.84 dBm
(3) 87.9 MHz	-101.1 dBm	-13.35 dBm	-87.75 dBm	96.5 MHz	17.79 dBm	-105.54 dBm
(4) 88.7 MHz	-101.1 dBm	-12.60 dBm	-88.50 dBm	94.9 MHz	15.64 dBm	-104.14 dBm
(5) 89.7 MHz (1)	-101.2 dBm	-12.90 dBm	-88.30 dBm	96.5 MHz	17.79 dBm	-106.09 dBm
(6) 90.1 MHz	-101.3 dBm	-13.25 dBm	-88.05 dBm	94.9 MHz	15.64 dBm	-104.14 dBm
(7) 90.9 MHz	-101.1 dBm	-13.00 dBm	-88.10 dBm	94.9 MHz	15.64 dBm	-103.74 dBm
(8) 91.1 MHz	-101.1 dBm	-13.18 dBm	-87.92 dBm	98.1 MHz	17.84 dBm	-105.76 dBm
(9) 91.7 MHz	-100.1 dBm	-12.60 dBm	-87.50 dBm	94.9 MHz	15.64 dBm	-103.14 dBm
(10) 91.9 MHz	-101.0 dBm	-12.50 dBm	-88.50 dBm	96.5 MHz	17.79 dBm	-106.29 dBm
(11) 92.7 MHz	-100.9 dBm	-12.50 dBm	-88.40 dBm	98.9 MHz	17.90 dBm	-106.30 dBm
(12) 92.9 MHz (1)	-100.8 dBm	-12.50 dBm	-88.30 dBm	98.1 MHz	17.84 dBm	-106.14 dBm
(13) 93.3 MHz (3)	See Note, 3	-12.40 dBm	See Note, 3	96.5 MHz & 94.9 MHz	17.79 dBm /15.64 dBm	See Note, 3
(14) 94.1 MHz (3)	See Note, 3	-12.55 dBm	See Note, 3	96.5 MHz	17.79 dBm	See Note, 3
(15) 94.3 MHz	-100.4 dBm	-12.52 dBm	-87.88 dbm	99.7 MHz	17.68 dBm	-105.56 dbm
(16) 94.5 MHz (1)	- 99.2 dBm	-12.60 dBm	-86.60 dBm	98.9 MHz	17.90 dBm	-104.50 dBm
(17) 94.9 MHz (2)	- 87.7 dBm	-12.50 dBm	-75.20 dBm	96.5 MHz	17.79 dBm	-92.99 dBm
(18) 95.1 MHz	- 93.8 dBm	-12.35 dBm	-81.45 dBm	98.1 MHz	17.84 dBm	-99.29 dBm
(19) 95.7 MHz (1)	- 99.2 dBm	-12.40 dBm	-86.80 dBm	94.9 MHz	15.64 dBm	-102.44 dBm
(20) 96.1 MHz	- 98.7 dBm	-12.37 dBm	-86.33 dBm	99.7 MHz	17.68 dBm	-104.01 dbm
(21) 96.5 MHz (2)	- 98.2 dBm	-12.40 dBm	-85.80 dBm	98.1 MHz & 94.9 MHz	17.84 dBm /15.64 dBm	-103.64 dBm /-101.44 dBm
(22) 96.7 MHz (2)	- 80.8 dBm	-12.30 dBm	-68.50 dBm	98.9 MHz	17.90 dBm	-86.40 dBm
(23) 97.1 MHz	- 99.9 dBm	-12.45 dBm	-87.45 dBm	101.1 MHz	16.20 dBm	-103.65 dBm
(24) 97.3 MHz	- 90.2 dBm	-12.34 dBm	-77.86 dBm	98.1 MHz	17.84 dBm	-95.70dBm
(25) 98.1 MHz (2)	- 99.7 dBm	-12.25 dBm	-87.45 dBm	98.9 MHz & 96.5 MHz	17.90 dBm /17.79 dBm	-105.35 dBm /-105.25 dBm
(26) 98.9 MHz (1,2)	- 92.3 dBm	-12.00 dBm	-80.30 dBm	101.1 MHz & 96.5 MHz	16.20 dBm /17.79 dBm	-96.5 dBm / -98.09 dBm
(27) 99.6 MHz	- 84.5 dBm	-12.00 dBm	-72.50 dBm	98.1 MHz	17.84 dBm	-90.34 dBm
(28) 99.7 MHz (1,3)	See Note, 3	-12.50 dBm	See Note,3	98.9 MHz & 96.5 MHz	17.90 dBm /17.84 dBm	See Note, 3
(29) 100.5 MHz	- 98.9 dBm	-12.30 dBm	-86.60 dBm	99.7 MHz	17.68 dBm	-104.28 dbm
(30) 101.3 MHz (2)	- 92.0 dBm	-12.30 dBm	-79.70 dBm	98.9 MHz & 98.1 MHz	17.90 dBm /17.84 dBm	-97.60 dbm / -97.54 dbm
(31) 102.1 MHz (1)	- 83.5 dBm	-12.35 dBm	-71.15 dBm	98.1 MHz	17.84 dBm	-88.90 dbm
(32) 102.5 MHz	-100.4 dBm	-12.00 dBm	-88.40 dBm	101.1 MHz	16.20 dBm	-104.60 dBm
(33) 102.9 MHz (1)	-100.4 dBm	-12.00 dBm	-88.40 dBm	98.9 MHz & 98.1 MHz	17.90 dBm /17.84 dBm	-106.30 dBm / -106.24 dBm
(34) 103.3 MHz (3)	See Note, 3	-11.95 dBm	See Note, 3	101.1 MHz	16.20 dBm	-101.37 dBm /-101.52 dBm
(35) 103.7 MHz (1)	-100.5 dBm	-11.90 dBm	-88.60 dBm	98.9 MHz	17.90 dBm	-106.50 dbm
(36) 104.1 MHz	-100.4 dBm	-12.00 dBm	-88.40 dBm	101.1 MHz	16.20 dBm	-104.60 dBm
(37) 104.5 MHz (1)	-100.3 dBm	-12.10 dBm	-88.20 dBm	98.9 MHz	17.90 dBm	-106.10 dBm
(38) 105.3 MHz	- 94.35 dBm	-12.05 dBm	82.30 dBm	99.7 MHz	17.68 dBm	-99.98 dBm
(39) 105.7 MHz	-100.1 dBm	-11.90 dBm	-88.20 dBm	101.1 MHz	17.14 dBm	-105.34 dbm
(40) 106.1 MHz	-100.5 dBm	-11.90 dBm	-88.60 dBm	99.7 MHz	17.68 dBm	-106.28 dBm
(41) 106.9 MHz	-100.0 dBm	-11.75 dBm	-88.25 dBm	105.1 MHz	12.83 dBm	-101.08 dBm
(42) 107.3 MHz	- 94.6 dBm	-11.90 dBm	-82.70 dBm	101.1 MHz	17.14 dBm	-99.84 dBm
(43) 108.1 MHz (1)	-100.6 dBm	-11.80 dBm	-88.80 dBm	101.1 MHz	17.14 dBm	-105.94 dBm
(44) 108.9 MHz (1)	-108.9 dBm	-11.70 dBm	-97.20 dBm	101.1 MHz	17.14 dBm	-114.34 dBm
(45) 109.1 MHz	-100.6 dBm	-11.80 dBm	-88.80 dBm	105.1 MHz	12.83 dBm	-101.63 dBm
(46) 110.5 MHz	-100.7 dBm	-11.80 dBm	-88.90 dBm	105.1 MHz	12.83 dBm	-101.73 dbm
(47) 111.3 MHz	-100.5 dBm	-11.75 dBm	-88.75 dBm	105.1 MHz	12.83 dBm	-101.58 dBm
(48) 112.1 MHz	-100.6 dBm	-11.65 dBm	-88.95 dBm	105.1 Mhz	12.83 dBm	-101.78 dBm
(49) 113.7 MHz	-108.9 dBm	-11.60 dBm	-97.30 dBm	105.1 Mhz	12.83 dBm	-110.13 dBm
(50) 115.3 MHz	-100.6 dBm	-11.50 dBm	-89.10 dBm	105.1 Mhz	12.83 dBm	-101.93 dBm
(51) 116.1 MHz	-100.7 dBm	-11.40 dBm	-89.30 dBm	105.1 Mhz	12.83 dBm	-102.13 dBm
(52) 116.9 MHz	-100.5 dBm	-11.50 dBm	-89.00 dBm	105.1 Mhz	12.83 dBm	-101.83 dBm

2) Selective Stations Were Intermittently Turned Off To Verify The Level Of Frequency.

1) Possible Product From Mixing With An Off Site Station.

3) Unable To Obtain Measurement Due To Interference From One Of The Following (Off Site) Stations : KPRS (103.3 MHz) ~ KYYS (99.7 MHz) ~ KFKF (94.1 MHz) ~ KMXV (93.3 MHz.)