ELECTRONICS RESEARCH, INC.
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Report Of Intermodulation Product Findings

AMERICAN TOWER COMBINED BROADCAST FACILITY
MIAMI, FLORIDA

WPYM	***93.1***
WLVE	***93.9***
WZTA	***96.5***
WPOW	***94.9***
WFLC	***97.3***
WHYI	***100.7***
WMXJ	***102.7***
WMIB	***103.5***
WHQT	***105.1***
WAMR	***107.5***

December 2004

Electronics Research Inc.
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REPORT OF FINDINGS
TEN STATION COMBINED AUXILIARY BROADCAST FACILITY
MIAMI, FLORDIA

Introduction : This report of findings is based on data collected at the WPYM, WLVE, WZTA, WPOW, WFLC, WHYI, WMXJ, WMIB, WHQT and WAMR American Tower master FM broadcast facility located in Miami, FL. The report includes measurements offered as proof that the combined operations of WPYM (93.1 MHz.), WLVE (93.9 MHz.), WZTA (94.9 MHz.), WPOW (96.5 MHz.), WFLC (97.3 MHz.), WHYI (100.7 MHz.), WMXJ (102.7 MHz.), WMIB (103.5 MHz.), WHQT (105.1 MHz.) and WAMR (107.5 MHz.) transmitters into the SHPX-16AC-HW-SP auxiliary antenna 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 Steapleton and Robert Rose of Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized herein on December 17, 2004.

The following exhibits are provided:

Exhibit A:
- A-1 Drawing Depicting Antenna.
- A-2 SHPX-16AC6-HW-SP Antenna Specification Sheet.
- A-3 Drawing Depicting Multiplexing Scheme.
- A-4 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 F_2 signifies the frequency causing the interference.

The Multiplexed System : At the time of my measurements ten FM stations were operating from the combined antenna system. The WPYM, WLVE, WZTA, WPOW, WFLC, WHYI, WMXJ, WMIB, WHQT and WAMR multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The SHPX-16AC6-HW-SP antenna is a product of Electronics Research, Inc, whereas the feed line is manufactured by Dielectric Inc. and the multiplexer units were manufactured by Shively Laboratories , Refer to Exhibit B-1, for an illustration of the Broadcasting Scheme of these stations.

To accomplish the aggregation of ten transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of 10 Constant Impedance Combiner modules is used. No adjustments were made on the existing combiner. See attached Exhibit A-3 for an illustration of the combiner layout. Performance measurements, such as match, loss, group-delay, etc, were not taken on the multiplexer. The transmitter operation revealed that the multiplexer unit was in proper working condition.

The IM Investigation : A clamp on type ERI Directional Coupler was placed in 9" transmission line on the output of the combiner. The coupler furnished was factory calibrated and capable of delivering accurate and repeatable RF measurements. To facilitate the taking of the measurements, this 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 could normally be used for antenna reflection measurements and thus would provide greater than 35 dB directivity and a forward signal sample of -42 dB. Exhibit A-3 also shows the location of this coupler.

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 FIM71 to ensure an adequate signal level for measurements without overloading the measurement equipment. A Potomac Instruments FIM-71 Field Strength Receiver 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 signal generator was used. An IFR Model 2399 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, Feed Line and Antenna were adjusted to optimal performance. Also, 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

Carrier Frequency (MHz)	Pad One (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dB:)	Scale Reading (dB)	**Adjusted Level (dB:)**	Notes
WPYM (93.1)	23	---	120	-3.9	**139.1**	
WLVE (93.9)	23	---	120	-4.1	**138.9**	
WZTA (94.9)	23	---	120	-4.1	**138.9**	
WPOW (96.5)	23	---	120	-4.0	**139.0**	
WFLC (97.3)	23	---	120	-3.8	**139.2**	
WHYI (100.7)	23	---	120	-4.2	**138.8**	
WMXJ (102.7)	23	---	120	-4.1	**138.9**	
WMIB (103.5)	23	---	120	-5.1	**137.9**	
WHOT (105.1)	23	---	120	-3.5	**139.5**	
WAMR (107.5)	23	---	120	-5.1	**137.9**	

Predictable third-order products due to system harmonics mixed with all on-site interfering frequencies that could be generated from the multiplexed system are calculated and listed in Table 2.

Table 2 - Third Order Products

	TRANSMITTER FREQUENCY									
Mix Freq.	**93.1**	**93.9**	**94.9**	**96.5**	**97.3**	**100.7**	**102.7**	**103.5**	**105.1**	**107.5**
93.1	---	94.7	96.7	99.9	101.5	108.3	112.3	113.9	117.1	121.9
93.9	92.3	---	95.9	99.1	100.7	107.5	111.5	113.1	116.3	121.1
94.9	91.3	92.9	---	98.1	99.7	106.5	110.5	112.1	115.3	120.1
96.5	89.7	91.3	93.3	---	98.1	104.9	108.9	110.5	113.7	118.5
97.3	88.9	90.5	92.5	95.7	---	104.1	108.1	109.7	112.9	117.7
100.7	85.5	87.1	89.1	92.3	93.9	---	104.7	106.3	109.5	114.3
102.7	83.5	85.1	87.1	90.3	91.9	98.7	---	104.3	107.5	112.3
103.5	82.7	84.3	86.3	89.5	91.1	97.9	101.9	---	106.7	111.5
105.1	81.1	82.7	84.7	87.9	89.5	96.3	100.3	101.9	---	109.9
107.5	78.7	80.3	82.3	85.5	87.1	93.9	97.9	99.5	102.7	---

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 for a layout of the measurement equipment.

Table 3 - Intermodulation Measurements

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*
78.7	93.1	107.5	23	6.1	29.1	20	15.1	34	139.1	**105.1**	
80.3	93.9	107.5	23	8.9	31.9	20	7.1	44.8	138.9	**94.1**	
81.1	93.1	105.1	23	8.9	31.9	20	4	2	139.1	**137.1**	
82.3	94.9	107.5	23	8.2	31.2	20	11.3	39.9	138.9	**99**	
82.7	93.1	103.5	23	8.5	31.5	20	6.9	44.6	139.1	**94.5**	
82.7	93.9	105.1	23	8.5	31.5	20	6.9	44.6	138.9	**94.3**	
83.5	93.1	102.7	23	8.1	31.1	20	3.1	48	139.1	**91.1**	
84.3	93.9	103.5	23	8.1	31.1	20	2.5	48.6	138.9	**90.3**	
84.7	94.9	105.1	23	8.5	31.5	20	2.7	48.8	138.9	**90.1**	
85.1	93.9	102.7	23	8.1	31.1	20	8.9	42.2	138.9	**96.7**	
85.5	93.1	100.7	23	8	31	20	7.1	43.9	139.1	**95.2**	
85.5	96.5	107.5	23	8	31	20	7.1	43.9	139	**95.1**	
86.3	94.9	103.5	23	8	31	40	17.8	53.2	138.9	**85.7**	
87.1	97.3	107.5	23	8	31	40	19.1	51.9	139.2	**87.3**	
87.1	93.9	100.7	23	8	31	40	19.1	51.9	138.9	**87**	
87.1	94.9	102.7	23	8	31	40	19.1	51.9	138.9	**87**	
87.9	96.5	105.1	23	7.9	30.9	20	2.5	48.4	139	**90.6**	
88.9	93.1	97.3	23	7.5	30.5	20	1.8	48.7	139.1	**90.4**	
89.1	94.9	100.7	23	7.4	30.4	20	0.8	49.6	138.9	**89.3**	
89.5	96.5	103.5	23	7.5	30.5	40	19.2	51.3	139	**87.7**	
89.5	97.3	105.1	23	7.5	30.5	40	19.2	51.3	139.2	**87.9**	
89.7	93.1	96.5	23	7.5	30.5	40	17.4	53.1	139.1	**86**	
90.3	96.5	102.7	23	7.3	30.3	40	19.5	50.8	139	**88.2**	
90.5	93.9	97.3	23	7.2	30.2	40	16.8	53.4	138.9	**85.5**	
91.1	97.3	103.5	23	7.1	30.1	40	16.9	53.2	139.2	**86**	
91.3	93.1	94.9	23	7.1	30.1	40	13.2	56.9	139.1	**82.2**	
91.3	93.9	96.5	23	7.1	30.1	40	13.2	56.9	138.9	**82**	
91.9	97.3	102.7	23	6.9	29.9	20	2.2	47.7	139.2	**91.5**	
92.3	93.1	93.9	23	6.9	29.9	40	16.1	53.8	139.1	**85.3**	
92.3	96.5	100.7	23	6.9	29.9	40	16.1	53.8	139	**85.2**	
92.5	94.9	97.3	23	7	30	40	14.1	55.9	138.9	**83**	
92.9	93.9	94.9	23	6.9	29.9	100	18.2	111.7	138.9	**27.2**	1
93.3	94.9	96.5	23	6.9	29.9	100	18.2	111.7	138.9	**27.2**	1
93.9	97.3	100.7	23						139.2	**Carrier**	2
93.9	100.7	107.5	23						138.8	**Carrier**	2
94.7	93.9	93.1	23	6.9	29.9	100	18.2	111.7	138.9	**27.2**	3
95.7	96.5	97.3	23	6.9	29.9	40	14.5	55.4	139	**83.6**	
95.9	94.9	93.9	23	6.8	29.8	40	14.5	55.3	138.9	**83.6**	
96.3	100.7	105.1	23	7.1	30.1	100	16.5	113.6	138.8	**25.2**	4
96.7	94.9	93.1	23	7.1	30.1	100	17.5	112.6	138.9	**26.3**	4
97.9	100.7	103.5	29	6.9	35.9	40	8.2	67.7	138.8	**71.1**	5
97.9	102.7	107.5	29	6.9	35.9	40	8.2	67.7	138.9	**71.2**	5
98.1	96.5	94.9	23	7.1	30.1	40	14.8	55.3	139	**83.7**	
98.1	97.3	96.5	23	7.1	30.1	40	14.8	55.3	139.2	**83.9**	
98.7	100.7	102.7	23	7.1	30.1	40	18.2	51.9	138.8	**86.9**	
99.1	96.5	93.9	23	7.2	30.2	60	18.5	71.7	139	**67.3**	6
99.5	103.5	107.5	23	7.2	30.2	20	3.2	47	137.9	**90.9**	
99.7	97.3	94.9	23	7	30	20	0.5	49.5	139.2	**89.7**	

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 *
99.9	96.5	93.1	23	7	30	40	15.2	54.8	139	**84.2**	
100.3	102.7	105.1	23	6.7	29.7	60	7.2	82.5	138.9	**56.4**	7
100.7	97.3	93.9	23						139.2	**Carrier**	7
101.5	97.3	93.1	23	6.9	29.9	60	15.5	74.4	139.2	**64.4**	8
101.9	102.7	103.5	23	6.8	29.8	40	12.6	57.2	138.9	**81.7**	
101.9	103.5	105.1	23	6.8	29.8	40	12.6	57.2	137.9	**80.7**	
102.7	105.1	107.5	23						138	**Carrier**	9
104.1	100.7	97.3	23	7	30	40	14.9	61.1	138.8	**83.7**	
104.3	103.5	102.7	23	8	31	40	15.5	55.5	137.9	**82.4**	
104.7	102.7	100.7	23	7	30	80	14.6	95.4	138.9	**43.5**	10
104.9	100.7	96.5	23	7.1	30.1	80	8.9	101.2	138.8	**37.6**	10
106.3	103.5	100.7	23	7.3	30.3	20	3.6	46.7	137.9	**91.2**	
106.5	100.7	94.9	23	7.5	30.5	40	18.1	52.4	138.8	**86.4**	
106.7	105.1	103.5	23	7.9	30.9	49	12.1	67.8	139.5	**71.7**	11
107.5	105.1	102.7	23						139.5	**Carrier**	12
107.5	100.7	93.9	23						138.8	**Carrier**	12
108.1	102.7	97.3	23	7.9	30.9	40	12.5	58.4	138.9	**80.5**	
108.3	100.7	93.1	23	8	31	20	8.8	42.2	138.8	**96.6**	
108.9	102.7	96.5	23	8	31	40	17.7	53.3	138.9	**85.6**	
109.5	105.1	100.7	23	8.1	31.1	40	15.2	55.9	139.5	**83.6**	
109.7	103.5	97.3	23	8	31	40	17.1	53.9	137.9	**84**	
109.9	107.5	105.1	23	8.1	31.1	40	15.3	55.8	137.9	**82.1**	
110.5	102.7	94.9	23	7.9	30.9	40	16.2	54.7	138.9	**84.2**	
110.5	103.5	96.5	23	7.9	30.9	40	16.2	54.7	137.9	**83.2**	
111.5	102.7	93.9	23	7.9	30.9	40	18.1	52.8	138.9	**86.1**	
111.5	107.5	103.5	23	7.9	30.9	40	18.1	52.8	137.9	**85.1**	
112.1	103.5	94.9	23	8.2	31.2	40	17.5	53.7	137.9	**84.2**	
112.3	107.5	102.7	23	8	31	40	17.2	53.8	137.9	**84.1**	
112.3	102.7	93.1	23	8	31	40	17.2	53.8	138.9	**85.1**	
112.9	105.1	97.3	23	8.2	31.2	40	15.3	55.9	139.5	**83.6**	
113.1	103.5	93.9	23	7.8	30.8	40	17.8	53	137.9	**84.9**	
113.7	105.1	96.5	23	7.9	30.9	40	14.1	56.8	139.5	**82.7**	
113.9	103.5	93.1	23	7.8	30.8	40	16.8	54	137.9	**83.9**	
114.3	107.5	100.7	23	7.9	30.9	40	18.7	52.2	137.9	**85.7**	
115.3	105.1	94.9	23	7.8	30.8	40	15.7	55.1	139.5	**84.4**	
116.3	105.1	93.9	23	7.9	30.9	20	10.3	40.6	139.5	**98.9**	
117.1	105.1	93.1	23	7.9	30.9	40	18.2	52.7	139.5	**86.8**	
117.7	107.5	97.3	23	7.5	30.5	40	18.8	51.7	137.9	**86.2**	
118.5	107.5	96.5	23	7.6	30.6	20	5.3	45.3	137.9	**92.6**	
120.1	107.5	94.9	23	7.6	30.6	20	6.5	44.1	137.9	**93.8**	
121.1	107.5	93.9	23	7.3	30.3	20	6.9	43.4	137.9	**94.5**	
121.9	107.5	93.1	23	7.8	30.8	20	10.1	40.7	137.9	**97.2**	

*** NOTES**

1) Measured signal is a system carrier WPYM transmitting at 93.1 MHz: No discernable signal was measured.
2) Measured signal is a system carrier WLVE transmitting at 93.9 MHz: No discernable signal was measured.
3) Measured signal is a system carrier WZTA transmitting at 94.9 MHz: No discernable signal was measured.
4) Measured signal is a system carrier WPOW transmitting at 96.5 MHz: No discernable signal was measured.
5) Measured signal is a system carrier WFLC transmitting at 97.3 MHz: No discernable signal was measured
6) Measured signal is a local carrier WEDR transmitting at 99.1 MHz: No discernable signal was measured
7) Measured signal is a system carrier WHYI transmitting at 100.7 MHz: No discernable signal was measured
8) Measured signal is a local carrier WLYF transmitting at 101.5 MHz: No discernable signal was measured
9) Measured signal is a system carrier WMIB transmitting at 102.7 MHz: No discernable signal was measured
10) Measured signal is a system carrier WHQT transmitting at 105.10 MHz: No discernable signal was measured.
11) Measured signal is a local carrier WRMA transmitting at 106.7 MHz: No discernable signal was measured.
12) Measured signal is a system carrier WAMR transmitting at 107.5 MHz: No discernable signal was measured.

The Spectrum Analyzer was used to check the close in spectral attenuation of each carrier to confirm the operation of these transmitters are 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 December 17th. 2004 as summarized in this document, I, Mark Steapleton, find the subject multiplexed system- specifically the transmitters and combiner system for the operation of the WPYM, WLVE, WZTA, WPOW, WFLC, WHYI, WMXJ WMIB, WHQT and WAMR into the SHPX-16AC6-HW-SP 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 WPYM, WLVE, WZTA, WPOW, WFLC, WHYI, WMXJ, WMIB, WHQT and WAMR 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 *Mark Steapleton*
Mark Steapleton Field Technician

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 24 years. I am familiar with and have assisted in the design, manufacturing and installation of FM Antennas and FM Multiplexers in my long tenure with ERI.

2.) I have either prepared and/or directly supervised the preparation of all technical information contained in this Report Of Findings and to my knowledge to be accurate and true.

3.) ERI has been requested by American Tower on behalf of radio stations WPYM, WLVE, WZTA, WPOW, WFLC, WHYI, WMXJ, WMIB, WHQT and WAMR in Miami, FL. to prepare this Report Of Findings.

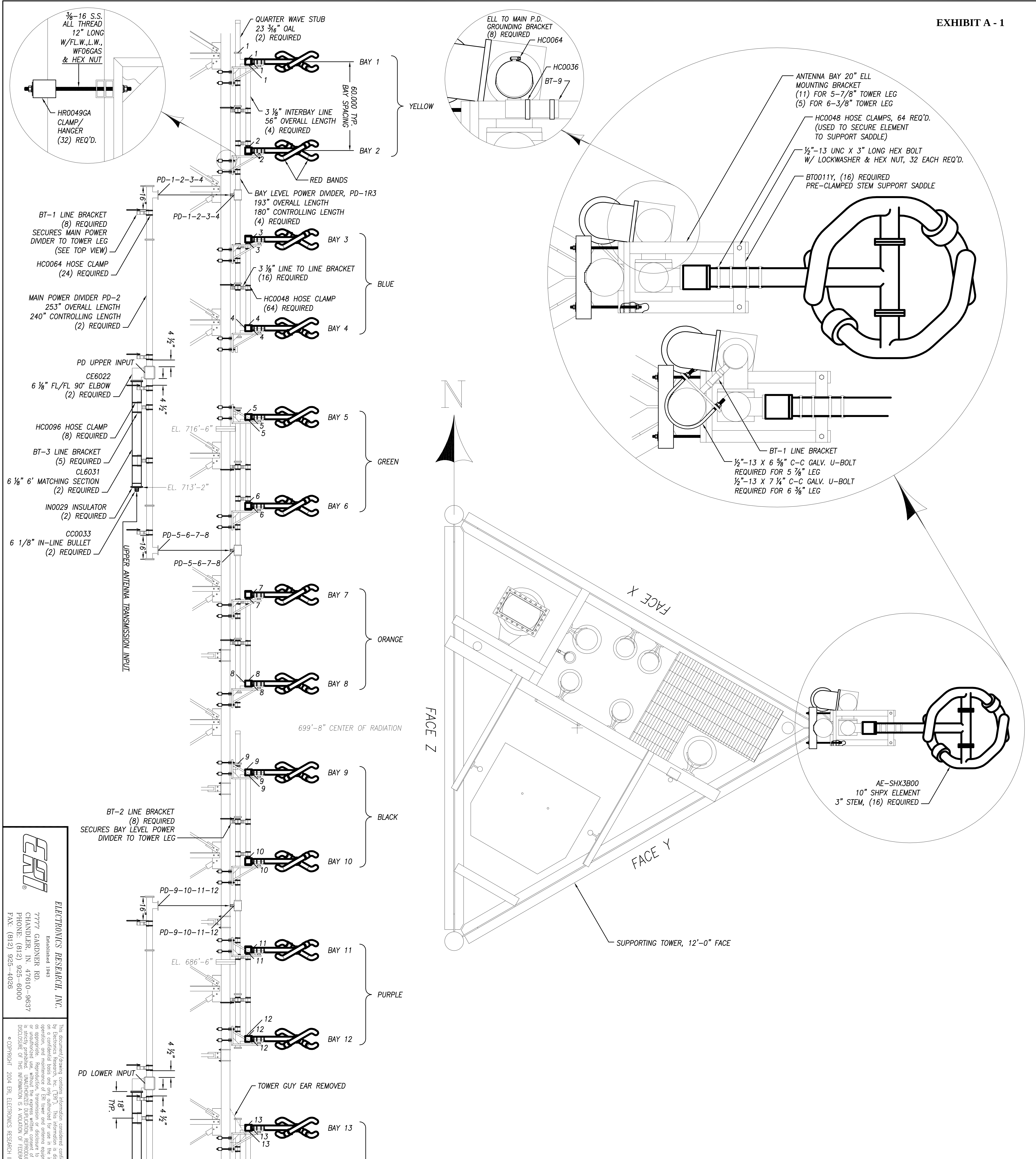
Mark Steapleton; Field Technician

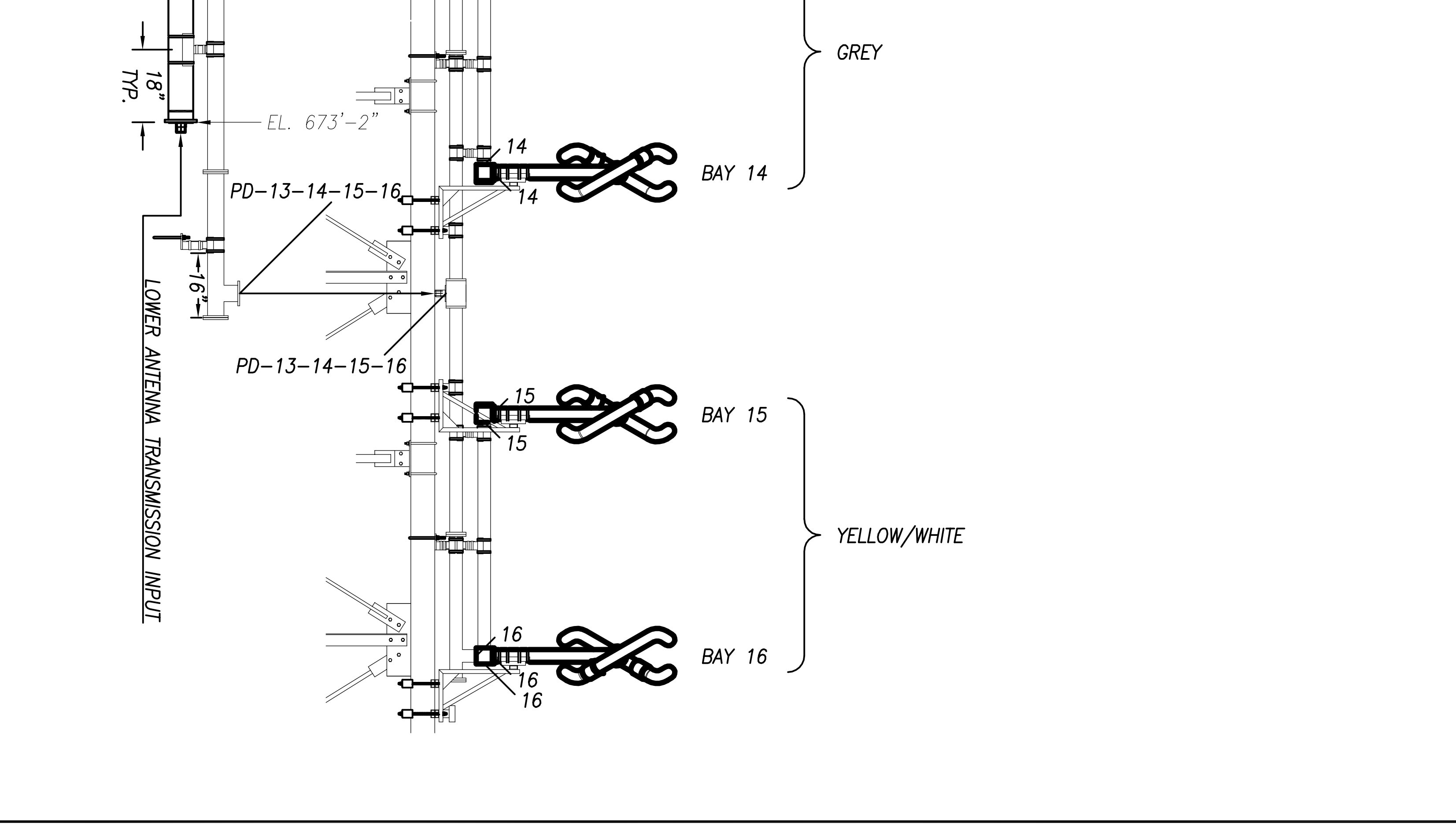
Subscribed and sworn to before me on this 21st. day of December 2004.

Jacquelyn Kinney; Notary Public
My commission expires July 5, 2007

NOTARY PUBLIC SEAL INDIANA

EXHIBIT A - 1





NOTES:

1) ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD.

2) COLOR LABELING IS FOR QUICK VISUAL PLACEMENT. ACTUAL ASSEMBLY OF ANTENNA SYSTEM SHOULD FOLLOW MATING CORRESPONDING NUMBERS & LETTERS.

3) ALL 3 1/8" LINE BLOCK CONNECTIONS REQUIRE 3/8"-16 X 7/8" LONG HEX BOLT W/ LOCKWASHER & OR2340S O-RING & GREASE.
ALL 3 1/8" LINE FLANGE CONNECTIONS REQUIRE 3/8"-16 X 1 1/2" LONG HEX BOLT W/ LOCKWASHER & HEX NUT, OR2340S O-RING & GREASE.
ALL 4 1/16" POWER DIVIDER BLOCK CONNECTIONS REQUIRE 3/8"-16 X 1" LONG HEX BOLT W/ LOCKWASHER & OR2348S O-RING & GREASE.
ALL 4 1/16" LINE FLANGE CONNECTIONS REQUIRE 3/8"-16 X 1 1/2" LONG HEX BOLT W/ LOCKWASHER & HEX NUT, OR2348S O-RING & GREASE.
ALL 6 1/8" POWER DIVIDER BLOCK CONNECTIONS REQUIRE 3/8"-16 X 1 1/4" LONG HEX BOLT W/ LOCKWASHER & OR2438S O-RING & GREASE.
ALL 6 1/8" LINE FLANGE CONNECTIONS REQUIRE 3/8"-16 X 1 3/4" HEX BOLT W/ LOCKWASHER & HEX NUT, OR2438S O-RING & GREASE.

4) OVERALL LENGTH OF ANTENNA SYSTEM IS 76'-0" APPROXIMATELY.

5) ENSURE TO PLUMB ANTENNA VERTICALLY BY LOOSENING HOSE CLAMPS ON PRE-CLAMPED SUPPORT SADDLES AND ADJUSTABLE LINE BRACKETS.

6) ROTATE CENTERFEED ASSEMBLY AS CLOSE TO TOWER AS POSSIBLE.

ERI
ELECTRONICS RESEARCH, INC.
Established 1943
7777 GARDNER RD.
CHANDLER, IN 47610-9637
PHONE: (812) 925-6000
FAX: (812) 925-4026

NO	REVISION	APP'D	DATE
1	UPDATED PER INSTALLATION		9/04 SMD
2			
3			
4			
5			
6			

NAME ANTENNA INSTALLATION
STATION MIAMI, FL / STAND-BY
FREQUENCY 863 MHz DESIGN FREQ. PROJECT NO. 10345.10
PATH G:\DRAFTING\ALL PROJECTS\10345.10
FILE A-1 DRAWN SJDESM SCALE NTS
DATE 6/11/04 APP'D
MODEL SHPX-16AC-HW-SP DWG NO. A-1

Miami, Florida

Issue #2: December 21, 2004

ERI Auxiliary Antenna Specification Summary
This project is exemplified in drawing No. E-1 Dated July 26, 2004

General Specifications

Antenna Type............................High Power FM-Broadcast, Suitable For Multi-Station Operation
Model Number.. SHPX-16AC-HW-SP (Side Mount)
Number Of Elements Comprising Design .... Sixteen, arranged As Follows:
A) Two (Independent) Eight Bay Arrays Placed On East Support Tower Leg.
B) The Arrangement
Input Feed Arrangement .... Each Antenna Half Fed Independently From Dual Feed
Broadcasting Mode ....Right Hand Circular Polarized
Station Capacity (Approximated) ....Ten, Class FM Broadcast Channels

Electrical Specifications

Input Power Capability (Dual Feed).............. 136 KW Maximum (68 KW, Each Antenna Half) (1)
Operating Band-Width... 93 - 108 Megahertz (15 MHz. Band)
VSWR (Each Half) ....Less Than 1.15:1 @ Operating Frequencies (2)
VSWR (System)... Less Than 1.25:1 @ Operating Frequencies (2)
Typical Azimuthal Pattern Circularity....................Less Than +/- 2 db From RMS (Free Space) (3)
Elevation Pattern ....Null Fill 0 % & Beam Tilt 0.0 Degrees
Power Split...50/50 (Horizontal & Vertical)
Axial Ratio .... Less Than 2 dB
Frequency Specific Information (Assumes 95% Antenna Efficiency):

Combiner losses are estimated therefore, some values (Losses & TPO's) are likely to be changed once actual losses are known.

Station	Frequency	TPO (Normal)	Losses (5)	Power Gain	Reduced ERP
WTMI	93.1 MHz	17.48 kW	0.847 dB	4.688	67.43 kW
WLVE	93.9 MHz	17.59 kW	0.898 dB	4.732	67.69 kW
WZTA	94.9 MHz	17.39 kW	0.799 dB	4.787	69.26 kW
WPOW	96.5 MHz	17.19 kW	1.051 dB	4.871	65.73 kW
WFLC	97.3 MHz	16.11 kW	0.752 dB	4.911	66.54 kW
WHYI	100.7 MHz	15.38 kW	0.956 dB	5.070	62.57 kW
WMXJ	102.7 MHz	15.86 kW	1.158 dB	5.153	62.60 kW
WMGE	103.5 MHz	14.40 kW	1.109 dB	5.183	57.98 kW
WHQT	105.1 MHz	15.92 kW	1.011 dB	5.239	66.08 kW
WAMR*	107.5 MHz	13.74 kW	1.214 dB	5.310	55.18 kW

* WAMR station is licensed to operate at 95 kW. The remaining 9 stations are licensed to operate at 100 kW.

Mechanical Specifications

The Furnished Weight And Wind-Loading Information Is Provided Less Support Structure

Support Spine..Preexisting 12'-0" Foot Face Triangular Tower
Calculated Antenna Area (Excluding Ice) .... 92 Ft² (4)
Weight (Excluding Ice)..2,200 Lbs
Antenna Harness .... All Rigid Coax, ($3^1/_8$, Smallest Coaxial Material Used)
Antenna Center of Radiation ....699.67 Feet above Average Terrain
Input Connectors... $6^1/_8$ Inch 50-Ohm EIA Flanged, Each Antenna Half
Array length ....76.0 Feet (Approx. Overall)
Bay Spacing .... 60 Inch
Construction Material (Antenna) .... All Non-Corrosive
Construction Material (Tower & Mounting) .... Galvanized Plated Steel and Stainless Steel

1. **Average Power and Peak Voltage assume: Operating VSWR of 1.15:1; atmospheric pressure, dry air, no solar loading and multiple carriers; maximum (unobjectionable) transformer conductor temperature of 100°C (212°F). For a margin of safety (Average Power and Peak Voltage), it is suggested that the antenna operate below its rated power. Determination of level is at the consumer's discretion.**

Note: for an increase of 1.09 times Average Power rating, pressurize the line with 5 lbs. nitrogen. The application of nitrogen pressurization increases rating to 75 kilowatts.

2. **Operating Configurations and VSWR:**
The antenna system was built to operate in any one of three modes:
Mode 1 & 2 involve operating from either the *Upper* or *Lower 8 bay* antenna halves.
Mode 3 (normal mode): Both *Upper* and *Lower 8 bay*s are combined from within the facility's combiner room using a *Broadband Tee Splitter* and patching system.
In planning for all contingencies, every effort was made to factory tune the antenna to the lowest possible VSWR. Consequently, the two antenna halves were optimized to be used separately or combined with the Tee Splitter.
The final antenna VSWR (as installed) may vary slightly as a result of combining the upper and lower halves and may be affected by:
   A) The actual tower geometry and other tower paraphernalia (horizontal struts, diagonal bracing, antenna feeds, conduits, etc.) may interact with antenna bay elements. This interaction was considered when the antenna was factory tuned; however, tower model uncertainty is beyond the control of ERI.

   B) The bandwidth of the *2 Way Tee Splitter* and its placement is only critical if the transmission line system (composed of many elements) is not at optimal performance.

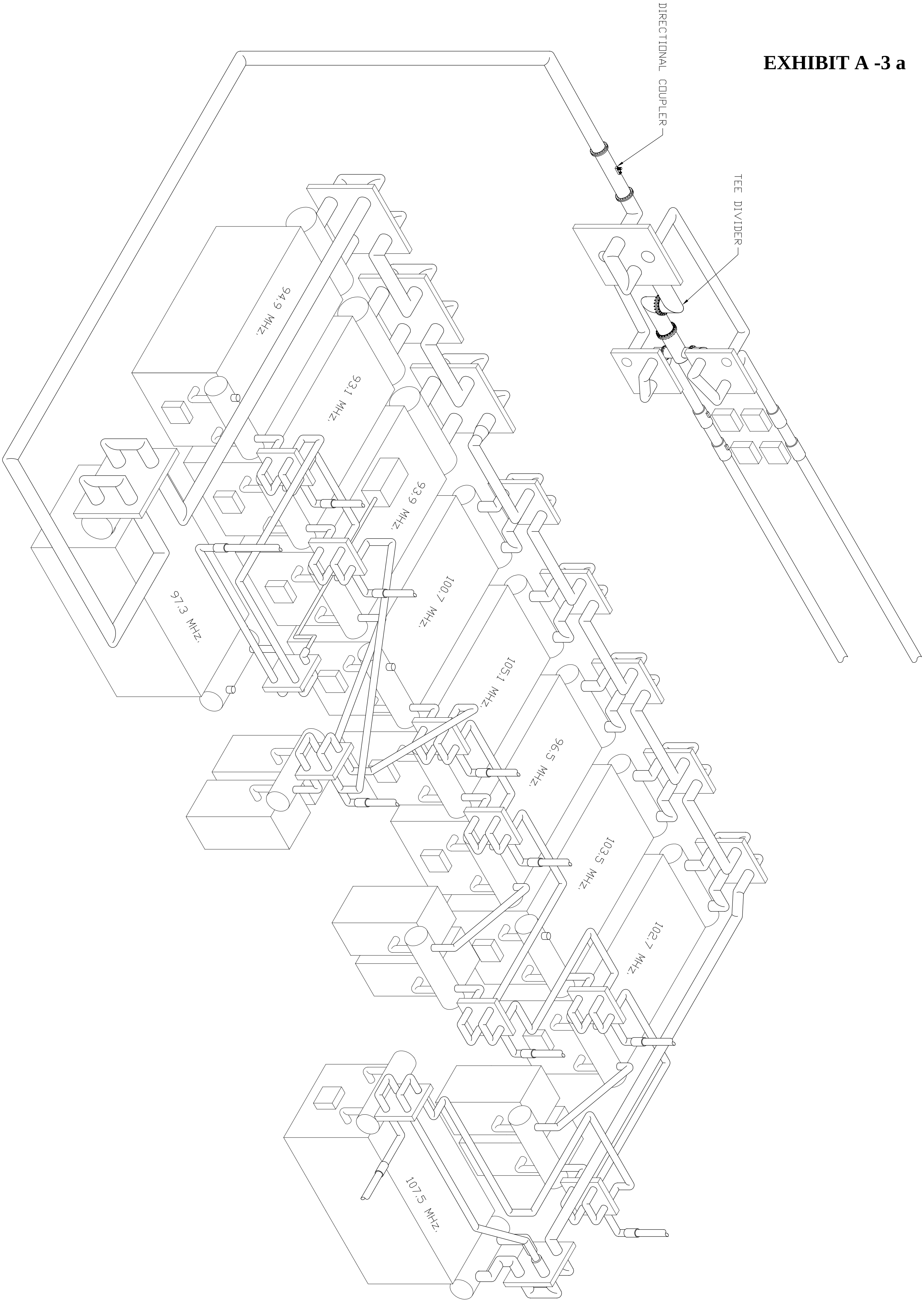
   C) A specification of 1.25:1 VSWR is believed to be a high estimate based on worst case conditions (accumulated mismatches of system components). The introduction of mismatches caused by Elbows and Anchor (Bullet) connections, Line Section Lengths, Patch Panels, Tee Splitter, Combiner Modules, etc. all contribute to the overall system VSWR.

3. **Typical value is for both Vertical and Horizontal radiation components as based on computer simulation with full scale setup verification.**

4. **Values based on TIA\EIA/RS-222-F Standard.**

5. **Estimated using: A) Dual runs of 6 1/8" rigid line totaling 798 feet in length and B) Estimated -0.35 db combiner losses.**

EXHIBIT A -3 a



DIRECTIONAL COUPLER
TEE DIVIDER
94.9 MHZ.
93.1 MHZ.
93.9 MHZ.
97.3 MHZ.
100.7 MHZ.
105.1 MHZ.
96.5 MHZ.
103.5 MHZ.
102.7 MHZ.
107.5 MHZ.

EXHIBIT A-4 a

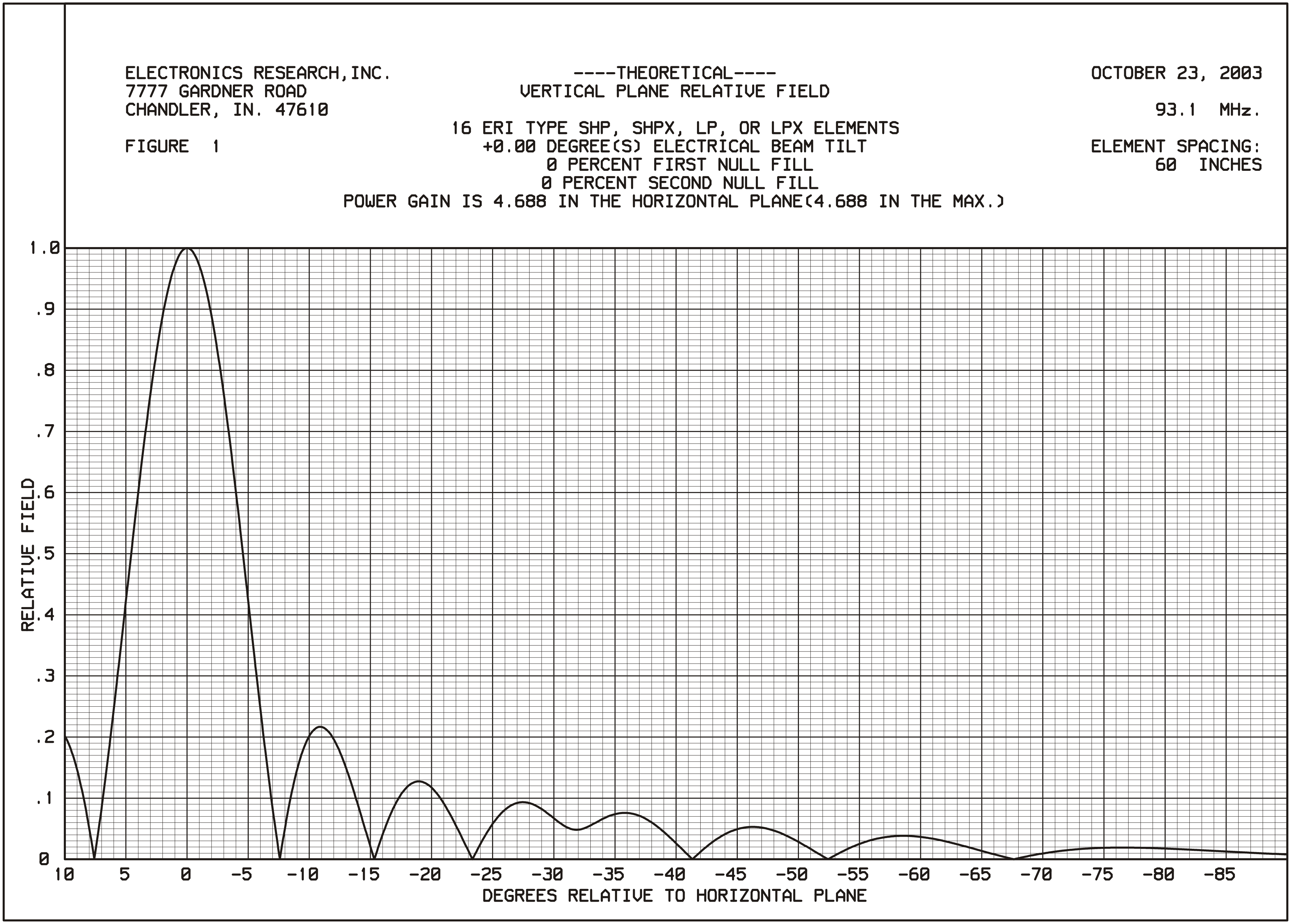
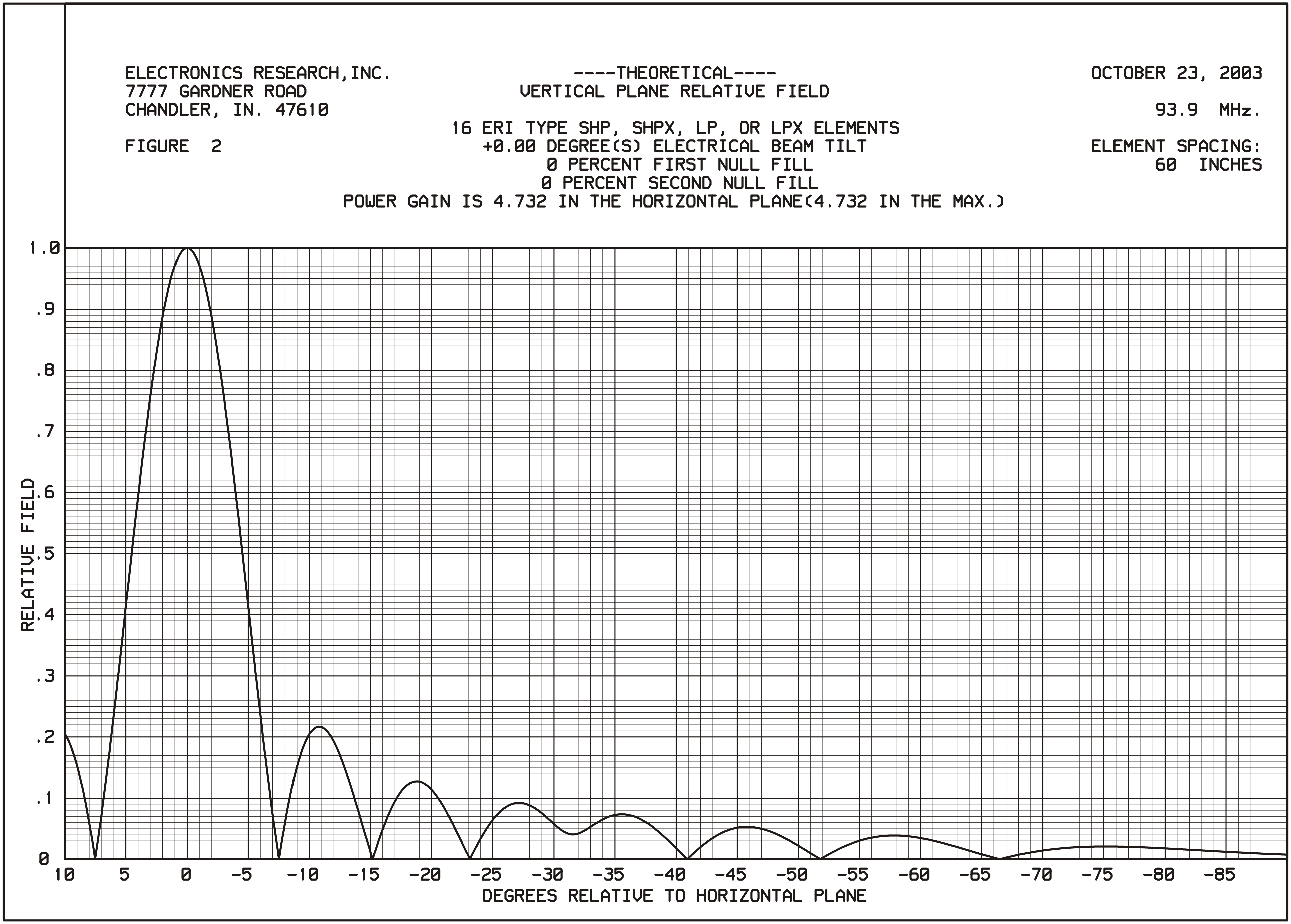

ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610
FIGURE 1
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 4.688 IN THE HORIZONTAL PLANE(4.688 IN THE MAX.)
OCTOBER 23, 2003
93.1 MHz.
ELEMENT SPACING:
60 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

EXHIBIT A-4-b



ELECTRONICS RESEARCH, INC.
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CHANDLER, IN. 47610
FIGURE 2
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 4.732 IN THE HORIZONTAL PLANE(4.732 IN THE MAX.)
OCTOBER 23, 2003
93.9 MHz.
ELEMENT SPACING:
60 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.
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FIGURE 3

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

16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 4.787 IN THE HORIZONTAL PLANE(4.787 IN THE MAX.)

OCTOBER 23, 2003

94.9 MHz.

ELEMENT SPACING:
60 INCHES

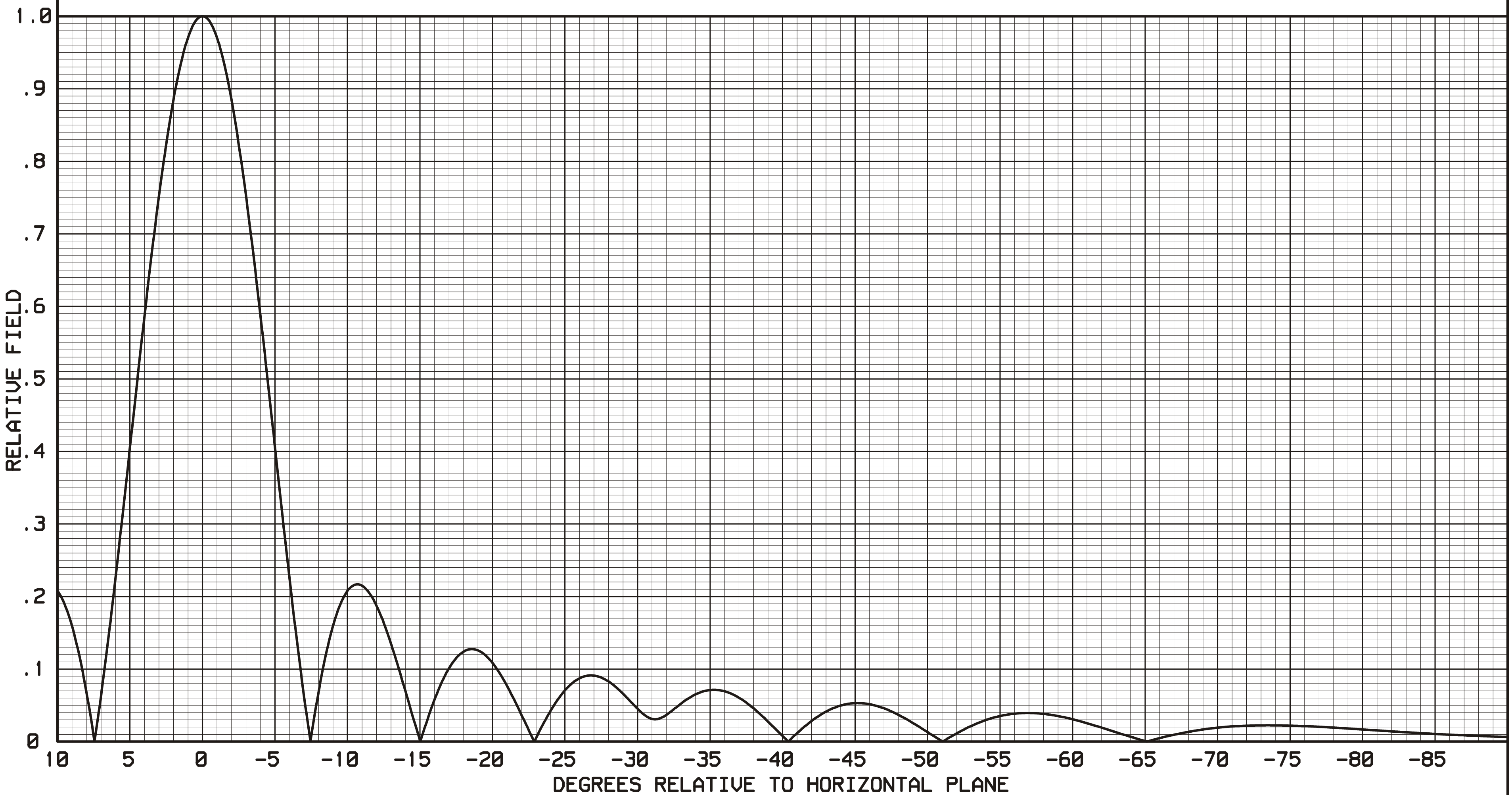
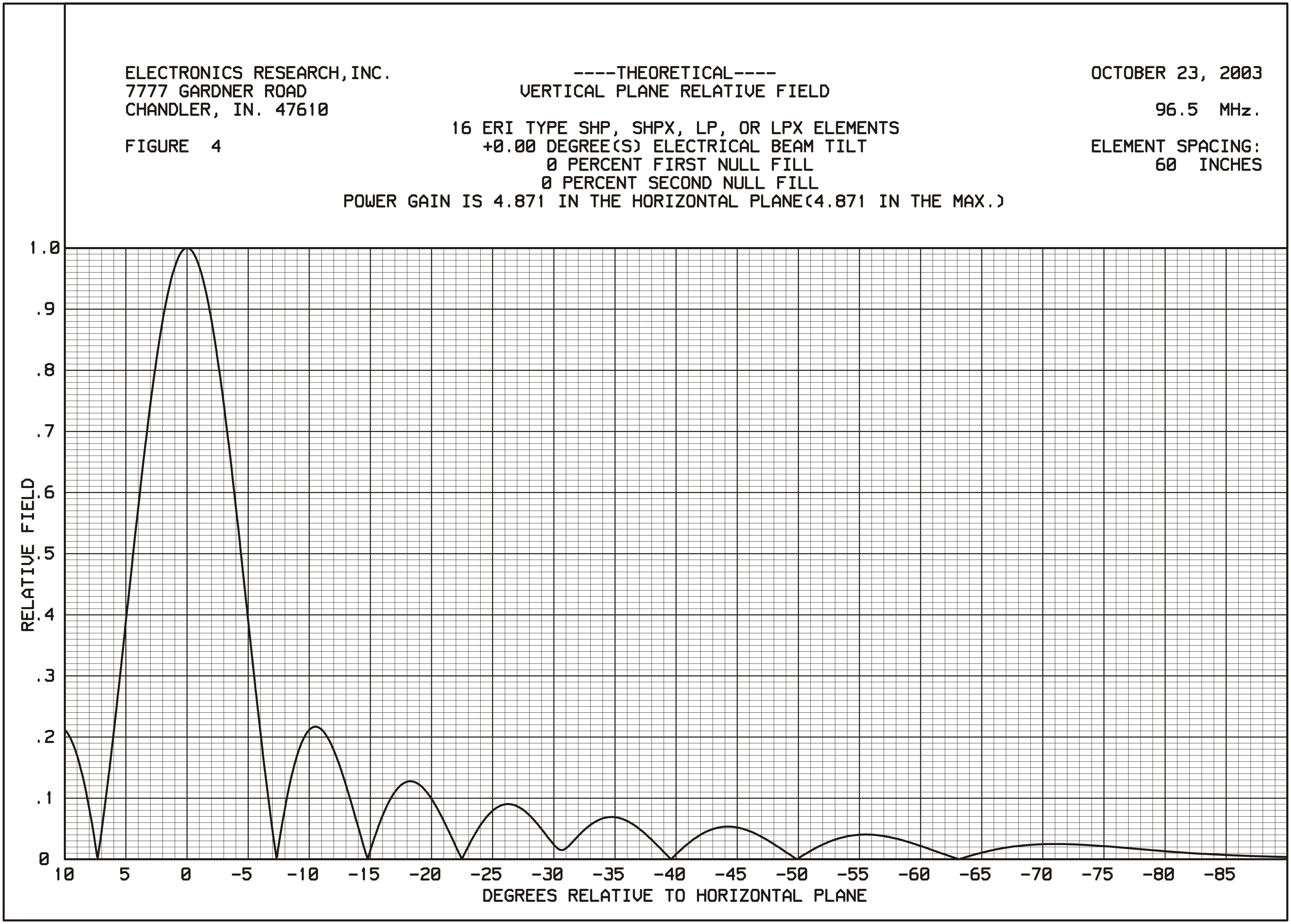


EXHIBIT A-4-d



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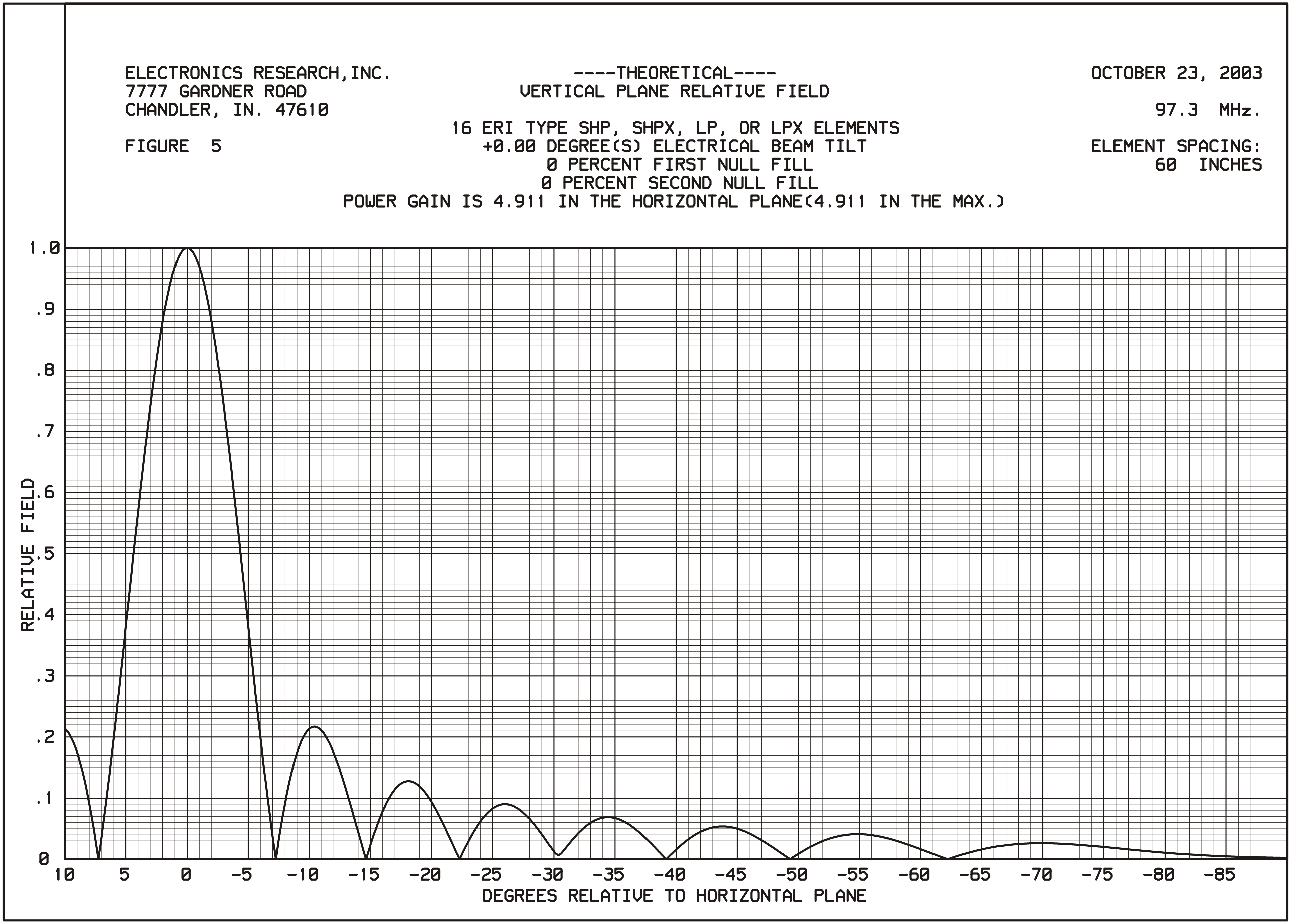
CHANDLER, IN. 47610
FIGURE 4
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 4.871 IN THE HORIZONTAL PLANE(4.871 IN THE MAX.)
OCTOBER 23, 2003
96.5 MHz.
ELEMENT SPACING:
60 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

EXHIBIT A-4-e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CHANDLER, IN. 47610
FIGURE 5
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 4.911 IN THE HORIZONTAL PLANE(4.911 IN THE MAX.)
OCTOBER 23, 2003
97.3 MHz.
ELEMENT SPACING:
60 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.
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CHANDLER, IN. 47610

FIGURE 6

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

16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.070 IN THE HORIZONTAL PLANE(5.070 IN THE MAX.)

OCTOBER 23, 2003

100.7 MHz.

ELEMENT SPACING:
60 INCHES

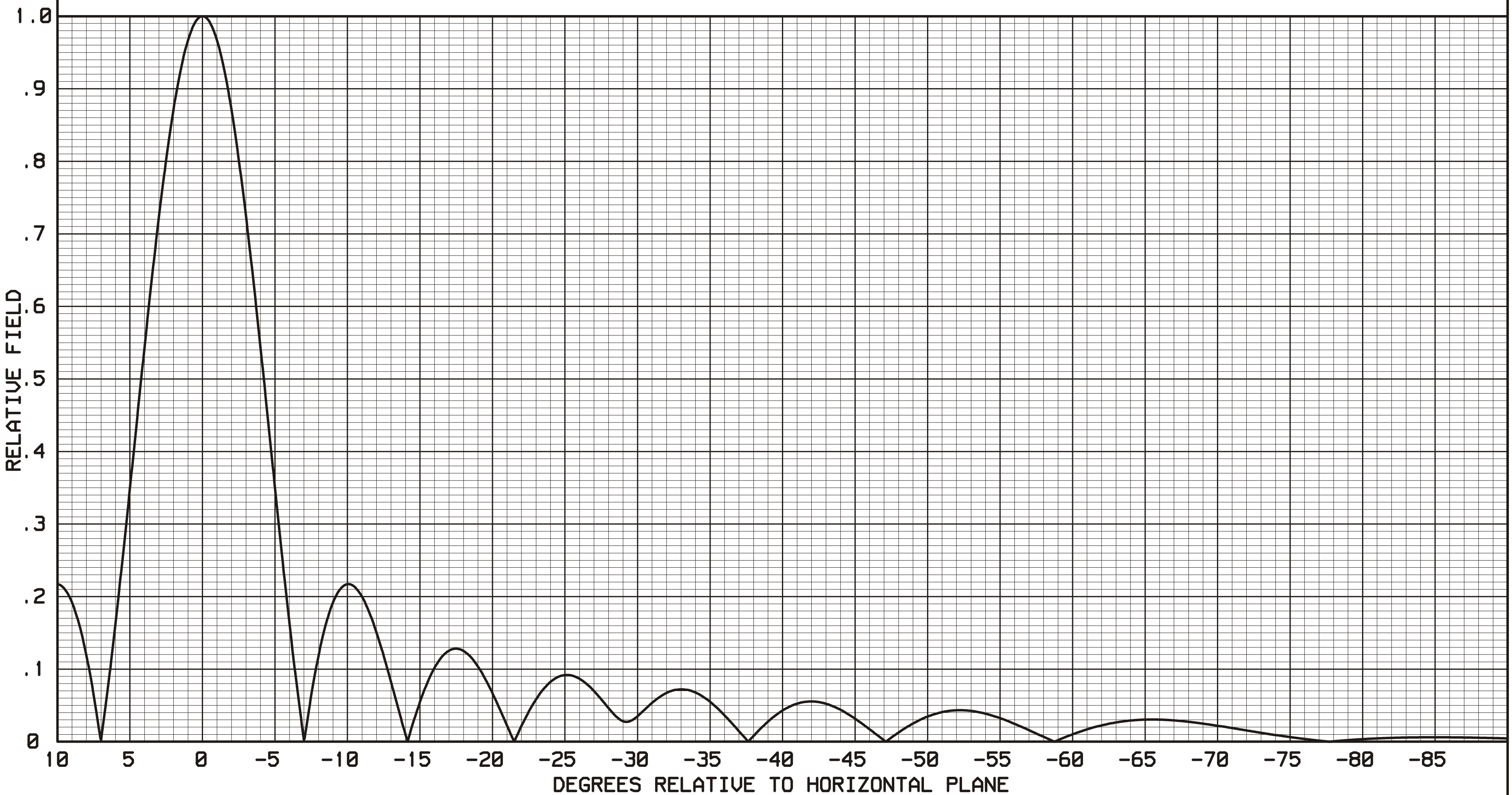

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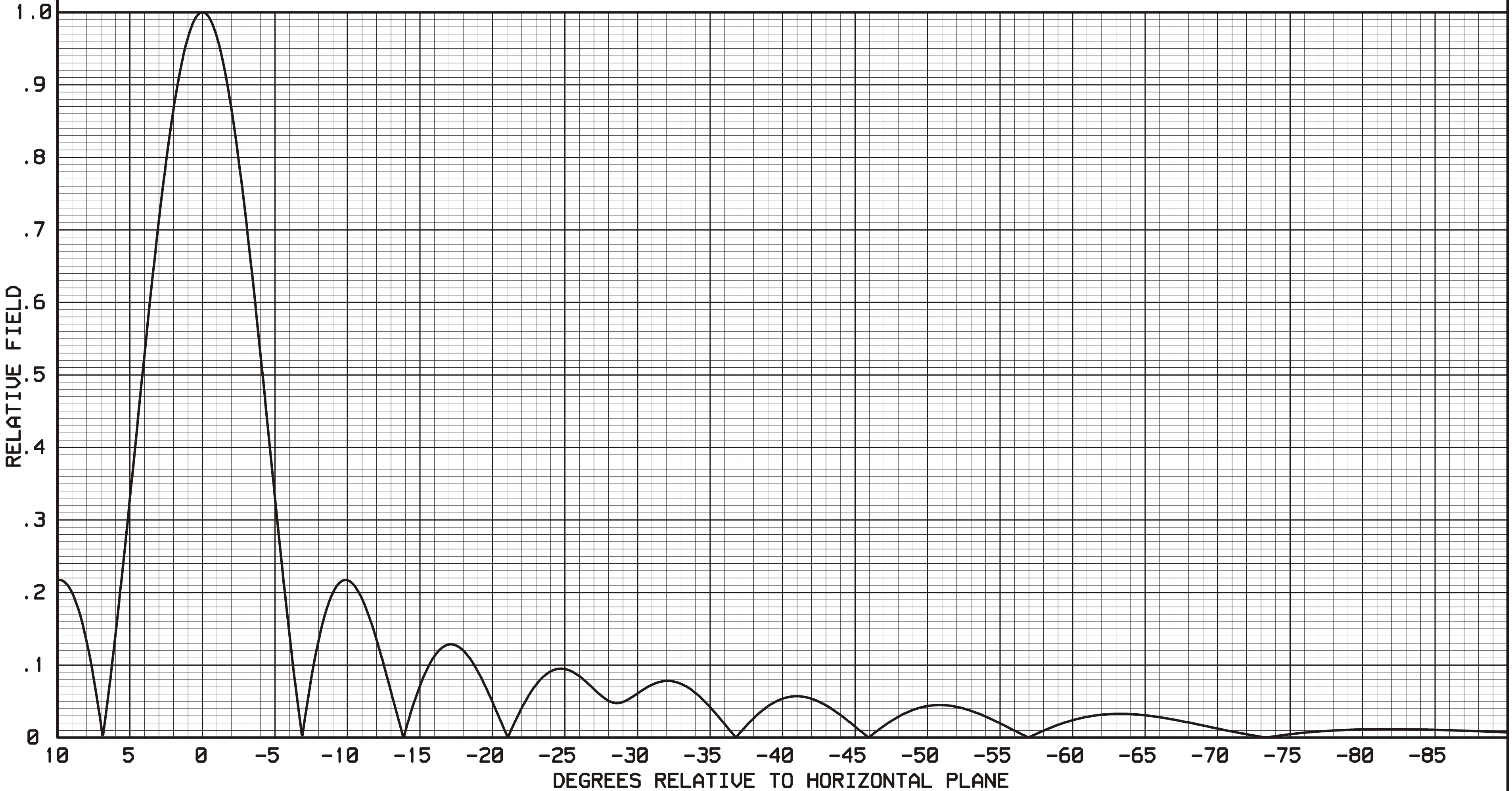
FIGURE 7

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.153 IN THE HORIZONTAL PLANE(5.153 IN THE MAX.)

OCTOBER 23, 2003

102.7 MHz.

ELEMENT SPACING:
60 INCHES



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CHANDLER, IN. 47610

FIGURE 8

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

16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.183 IN THE HORIZONTAL PLANE(5.183 IN THE MAX.)

OCTOBER 23, 2003

103.5 MHz.

ELEMENT SPACING:
60 INCHES

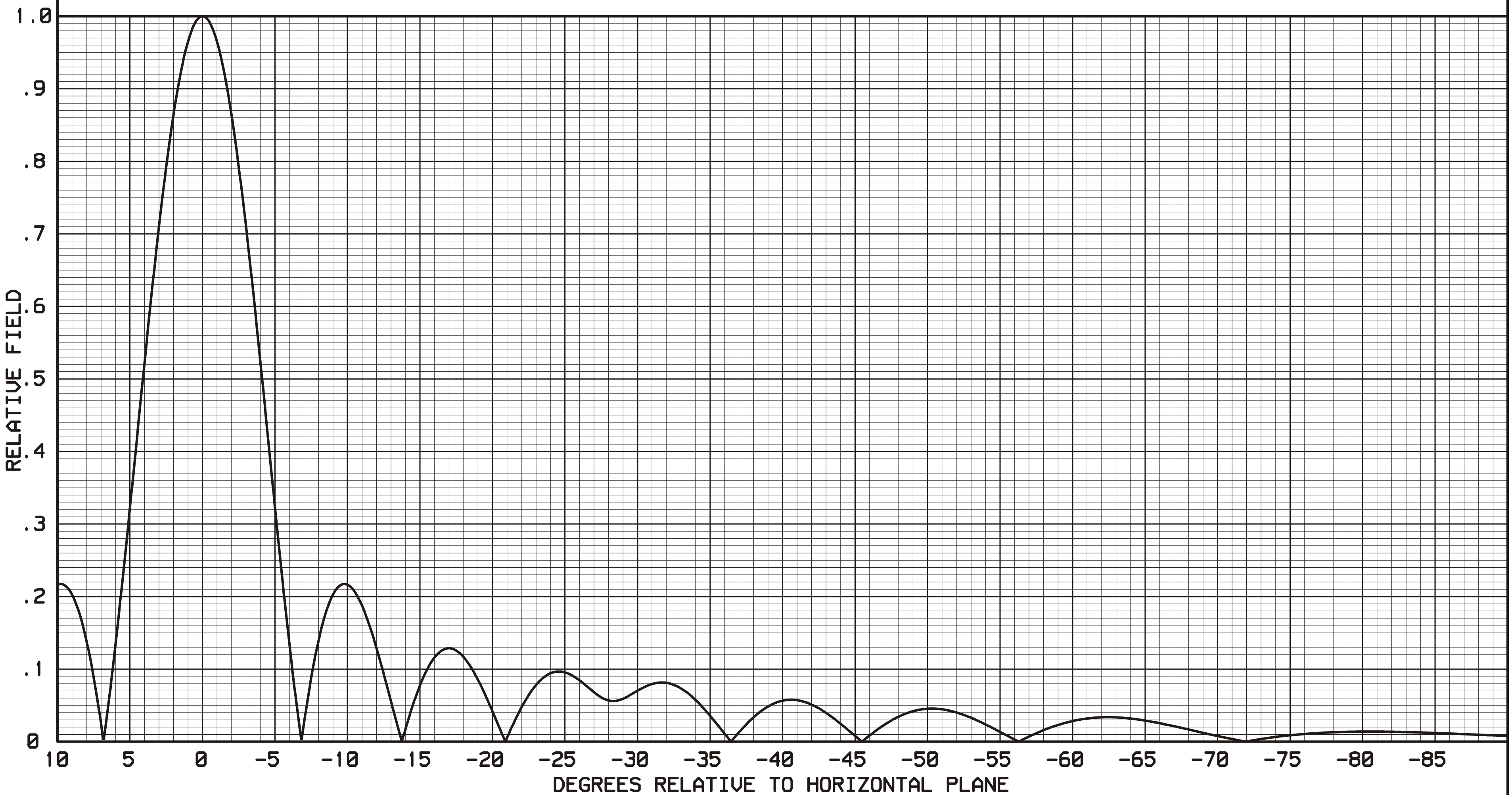

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FIGURE 9

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

16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.239 IN THE HORIZONTAL PLANE(5.239 IN THE MAX.)

OCTOBER 23, 2003

105.1 MHz.

ELEMENT SPACING:
60 INCHES

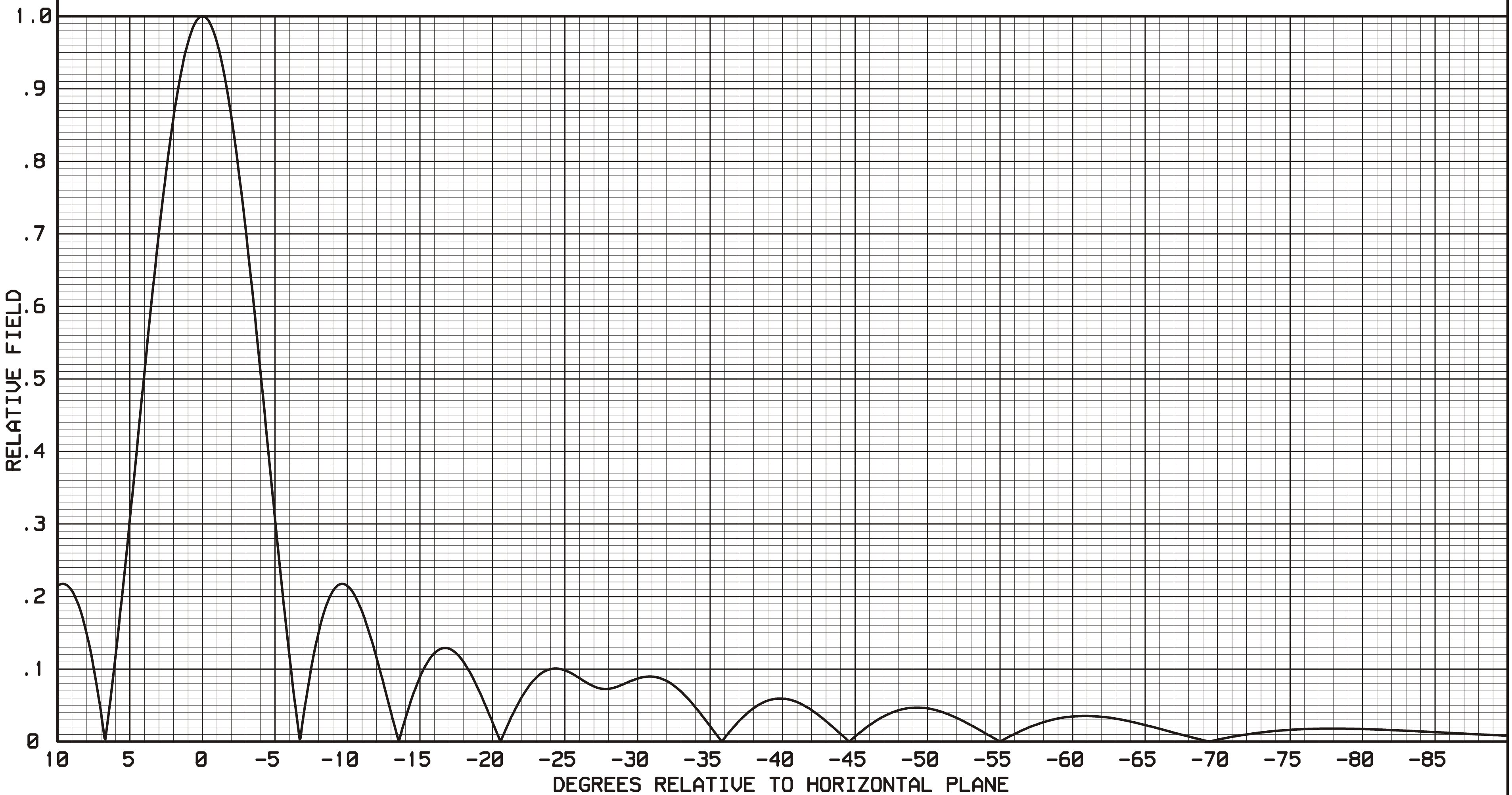

EXHIBIT A-4-j

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FIGURE 10

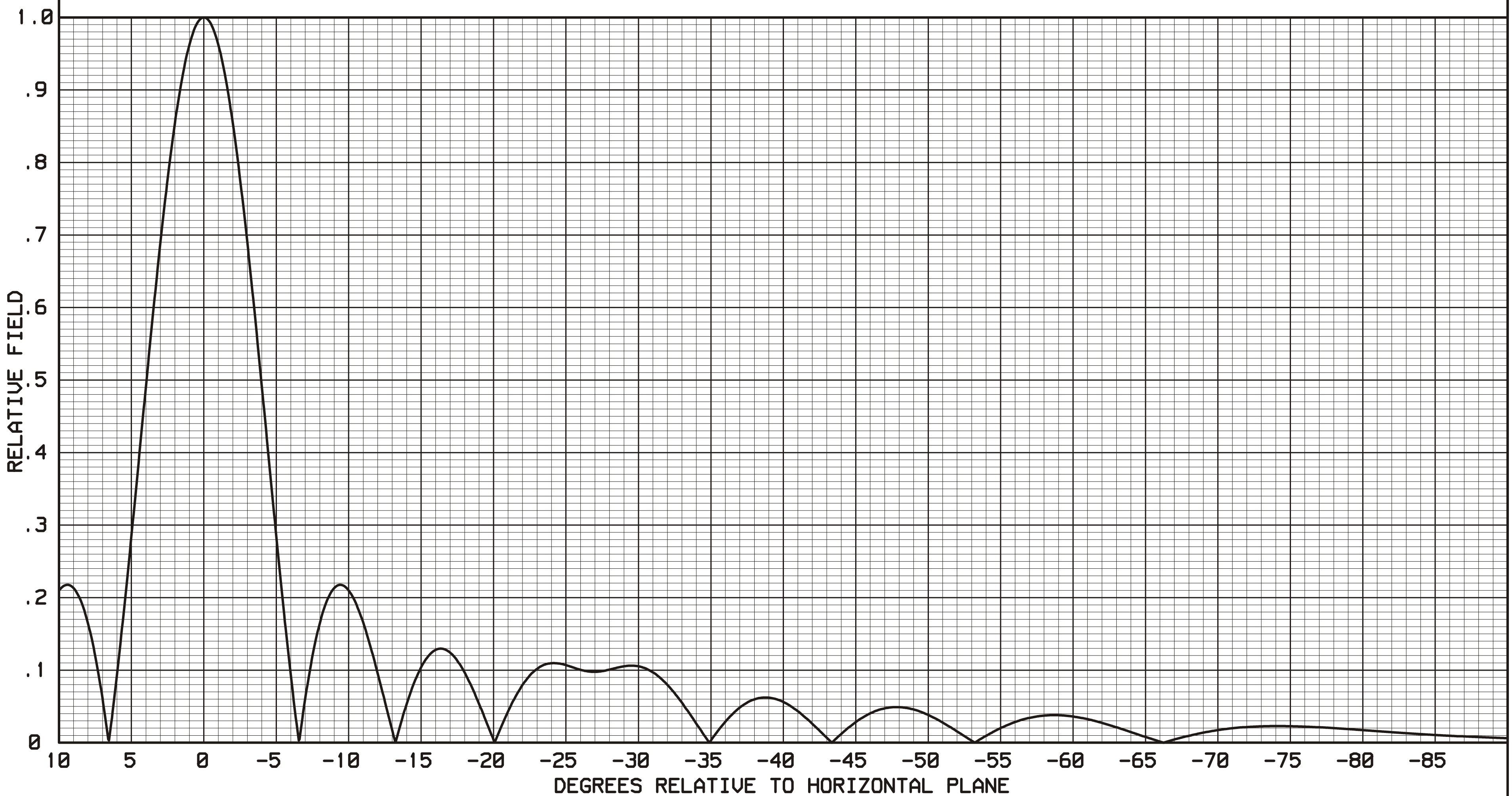
----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

16 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS
+0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 5.311 IN THE HORIZONTAL PLANE(5.311 IN THE MAX.)

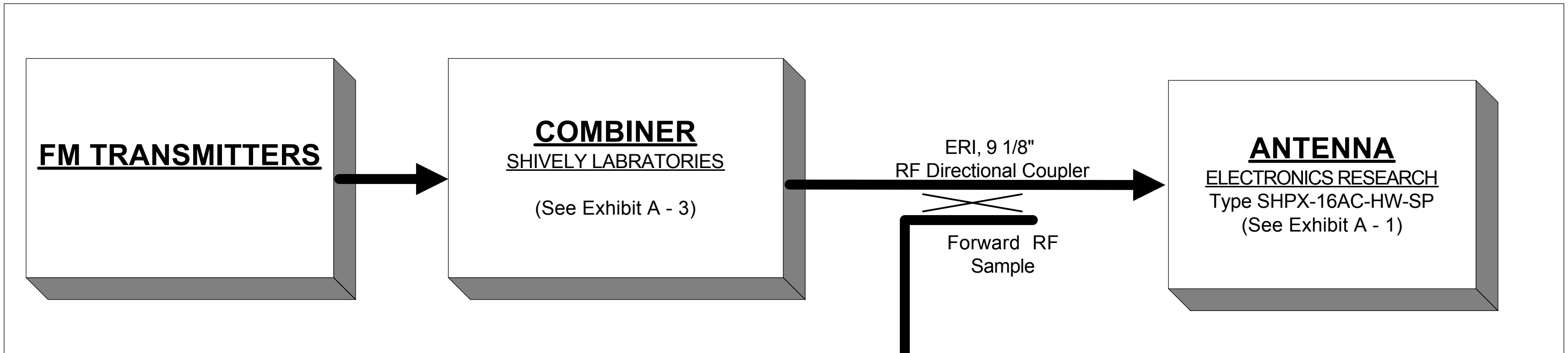
OCTOBER 23, 2003

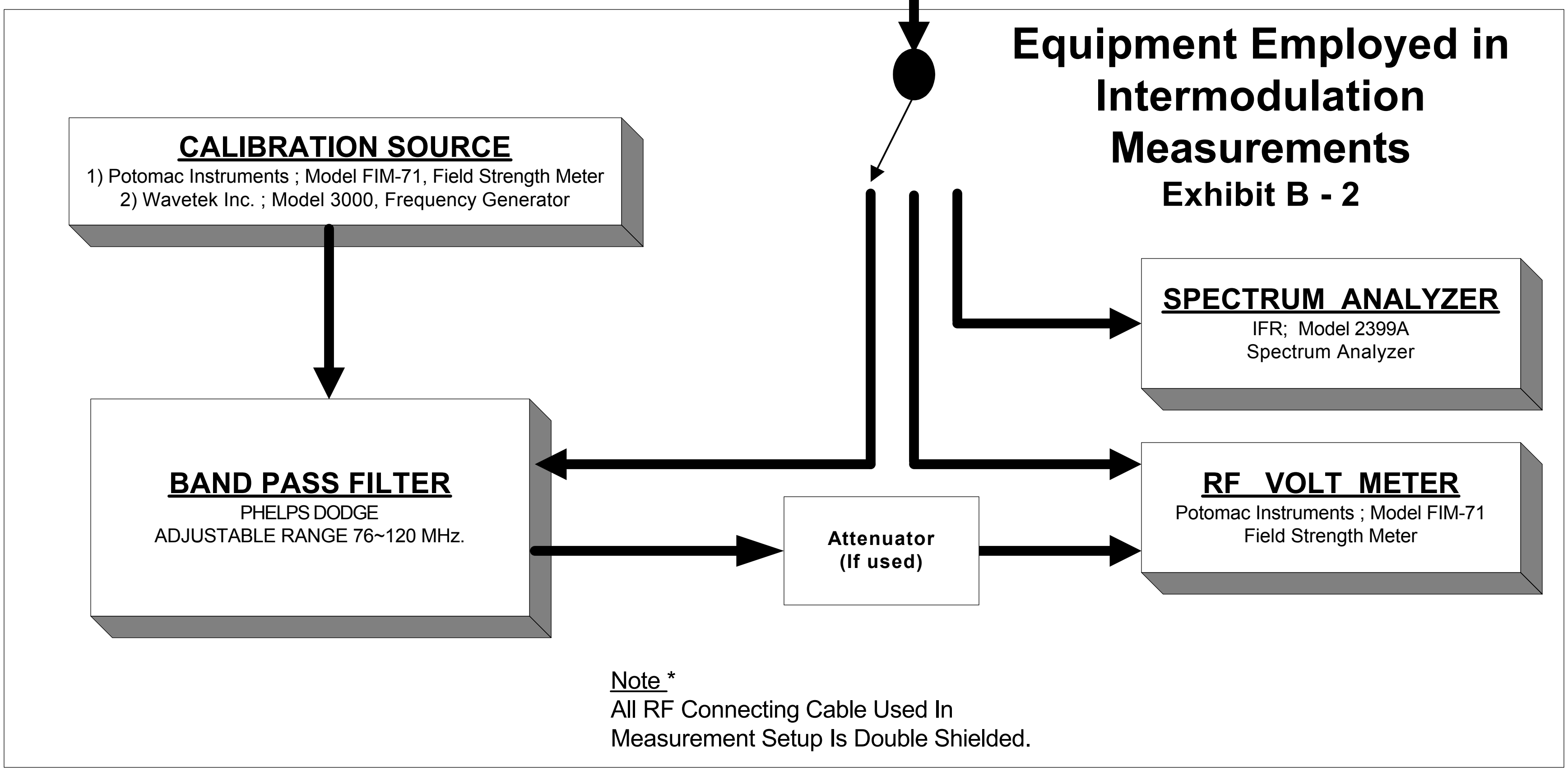
107.5 MHz.

ELEMENT SPACING:
60 INCHES



Broadcasting Scheme EXHIBIT - B1





Broadcasting Scheme and Equipment Employed in Intermodulation Measurements

EXHIBIT B