Electronics Research, Inc.
Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com/

Directional Antenna System for WRTQ, Ocean City, New Jersey

June 6, 2005

Electronics Research Inc. is providing modifications to an existing directional antenna system that is specially designed to meet the FCC requirements and the general needs of radio station WRTQ.

The antenna is the ERI model P300-2AE/37M-1E-DA-SP configuration. The dual polarized system consists of 2 full-wavelength vertical bays using one driven vertical dipole and two vertical parasitic elements per bay. The horizontal component of the system consists of one 37M ”ring” antenna, which is interleaved between the vertical bays. A power divider was used near the bottom of the antenna to feed the system.

The antenna was mounted on the North 14.535 degrees East tower leg with bracketry to provide a vertical antenna orientation of North 74 degrees East and a horizontal antenna orientation of North 314 degrees East. The antenna was tested on a 36" Sabre tower, which is the structure the station plans to use to support the array for this modification. All tests were performed on a frequency of 91.3 megahertz, which is the center of the FM broadcast channel assigned to WRTQ.

Pattern measurements were made on a sixty-acre antenna pattern range, which is owned and operated by Electronics Research, Inc. The tests were performed under the direction of Thomas B. Silliman, president of Electronics Research, Inc. Mr. Silliman has the Bachelor of Electrical Engineering and the Master of Electrical Engineering degrees from Cornell University and is a registered professional engineer in the states of Indiana, Maryland and Minnesota.

Directional Antenna System
For
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(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of the complete dual polarized system with the associated vertical parasitic elements. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna. Sections of 3 1/5 inch o.d. rigid coaxial line were used to feed the test antenna, and sections of 3 1/8 inch o.d. rigid outer conductor only were attached above the test antenna. The lines were properly grounded during all tests.

The power distribution and phase relationship to the antenna was adjusted in order to achieve the directional radiation pattern for both horizontal and vertical polarization components.

The proof-of-performance was accomplished using a supporting structure of identical dimension and configuration as the 36" Sabre tower, including all braces, ladders, conduits, coaxial lines and other appurtenances that are included in the actual aperture at which the antenna will be installed. The 36" Sabre tower was erected vertically on a turntable mounted on a non-metallic building with the antenna centered vertically on the structure, making the center of radiation of the test approximately 30 feet above ground. The turntable is equipped with a motor drive and azimuth indicating mechanism, resolution of this azimuth measuring device is one-tenth of a degree.

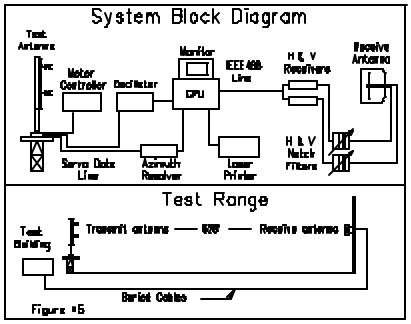


Figure #5

The antenna under test was operated in the transmitting mode and fed from a Wavetek Model 3000 signal generator. The frequency of the signal source was set at 91.3MHz and was constantly monitored by an Anritsu Model ML521B measuring receiver.

A broad-band horizontal and vertical dipole system, located approximately 628 feet from the test antenna, and mounted at the same height above terrain as the center of the antenna under test, was used to receive the emitted test signals. The signals received by the dipole system were fed to test building by way of two buried Heliax cables to an Anritsu Model ML521B measuring receiver.

This data was interfaced to a Hewlett-Packard Laser Jet 4P printer by means of a Pentium computer system. Relative field strength was plotted as a function of azimuth.

The measurements were performed by rotating the test antenna in a counter-clockwise direction and plotting the received signal on polar co-ordinated graph paper in a clockwise direction. Both horizontal and vertical components were recorded separately.

CONCLUSIONS

The vertical component of the dual polarized system consists of 2 full-wavelength bays using one driven vertical dipole and two vertical parasitic elements per bay. The horizontal component consists of one bay. A power divider was used near the bottom of the antenna to feed the system.

The antenna was mounted on the North 14.535 degrees East tower leg with bracketry to provide a vertical antenna orientation of North 74 degrees East and a horizontal antenna orientation of North 314 degrees East. The power distribution and phase relationship was fixed when antenna was originally manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment. Blue prints provided with the antenna will show the proper antenna orientation alignment. The antenna alignment procedure should be directed by a licensed surveyor as prescribed by the FCC.

Deicers are supplied for the horizontal antenna and radomes are supplied for the vertical dipoles.

The measured horizontal plane relative field pattern, for both the horizontal and vertical polarization components, is shown on Figure #1 attached. A calculated vertical plane relative field pattern for the vertically polarized component is shown on Figure #3 attached. A calculated vertical plane relative field pattern for the horizontally polarized component is shown on Figure #3A attached. The power in the maximum will reach 10.5 kilowatts (10.212 dBk).

The measured horizontal component does not exceed the filed vertical envelope pattern at any azimuth.

The clear vertical length of the structure required to support the antenna is 36 feet.

Directional Antenna System
For
WRTQ, Ocean City, New Jersey

(Continued)

The directional antenna should not be mounted on the top of an antenna tower, which includes a top-mounted platform larger than the cross-sectional area of the tower in the horizontal plane. No other obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted at the same tower level as the directional antenna. No obstruction of any type is to be within 75 ft. horizontally of the system. The vertical distance to the nearest obstruction should be a minimum of 10 ft. from the directional antenna.

The calculated maximum power gain of the horizontal component is 0.341 (-4.678 dB).

The calculated maximum power gain of the vertically polarized component is 3.372 (5.279 dB).

The calculated input power to the antenna input flange is 3.113 kilowatts (4.932 dBk) to provide a maximum horizontal ERP of 1.060 kilowatts (0.253 dBk) and a maximum vertical ERP of 10.5 kilowatts (10.212 dBk). The input flange to the antenna is 3 1/8 inch male.

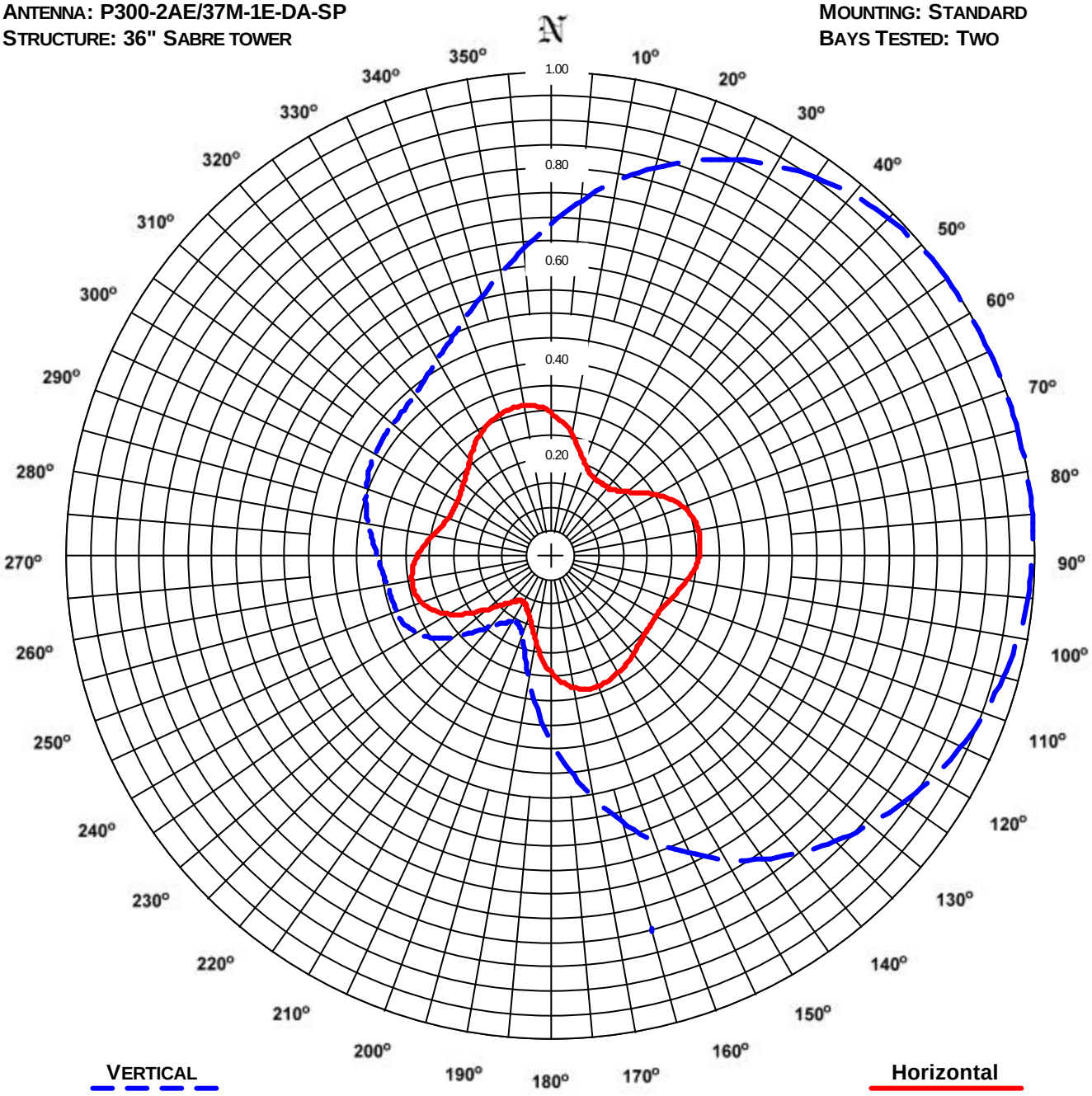
ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com/

FIGURE NO: 1
STATION: WRTQ
LOCATION: OCEAN CITY, NEW JERSEY
ANTENNA: P300-2AE/37M-1E-DA-SP
STRUCTURE: 36" SABRE TOWER

DATE: 6/6/2005
FREQUENCY: 91.3 MHZ
ORIENTATION: 74° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



VERTICAL

RMS: 0.676
MAXIMUM: 1.000 @ 55° TRUE
MINIMUM: 0.153 @ 207° TRUE

Horizontal

RMS: 0.251
Maximum: 0.318 @ 349° True
Minimum: 0.109 @ 212° True

COMMENTS: MEASURED PATTERNS OF THE HORIZONTAL AND VERTICAL COMPENTS.

ERI® Horizontal Plane Relative Field List

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com/

Station: WRTQ
Location: Ocean City, NJ
Frequency: 91.3 MHz

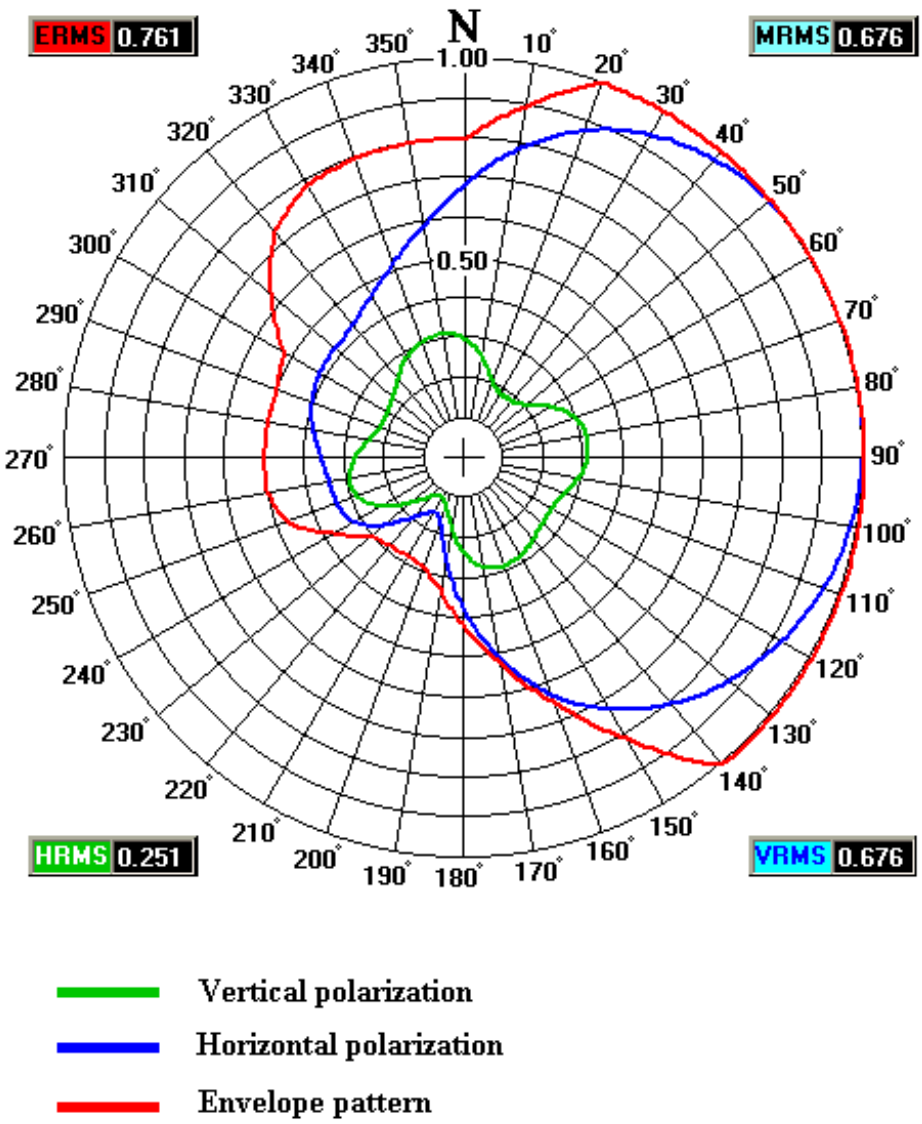
Antenna: P300-2AE/37M-1E-DA-SP
Orientation: 74° True
Tower: 36" Sabre tower

Figure: 1
Date: 6/6/2005
Reference: wrtq3m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.297	0.93	-0.33	0.687	4.95	6.95	180°	0.238	0.59	-2.26	0.380	1.52	1.82
5°	0.279	0.82	-0.87	0.739	5.74	7.59	185°	0.209	0.46	-3.37	0.316	1.05	0.21
10°	0.255	0.69	-1.64	0.788	6.53	8.15	190°	0.178	0.33	-4.77	0.260	0.71	-1.49
15°	0.229	0.55	-2.60	0.832	7.28	8.62	195°	0.151	0.24	-6.20	0.208	0.45	-3.44
20°	0.207	0.45	-3.49	0.871	7.97	9.01	200°	0.130	0.18	-7.50	0.173	0.31	-5.04
25°	0.191	0.38	-4.15	0.905	8.60	9.34	205°	0.117	0.14	-8.45	0.155	0.25	-5.97
30°	0.185	0.36	-4.46	0.934	9.15	9.61	210°	0.110	0.13	-8.97	0.155	0.25	-5.96
35°	0.184	0.36	-4.49	0.957	9.62	9.83	215°	0.111	0.13	-8.87	0.167	0.29	-5.34
40°	0.185	0.36	-4.43	0.975	9.99	10.00	220°	0.121	0.15	-8.10	0.188	0.37	-4.31
45°	0.193	0.39	-4.07	0.989	10.27	10.11	225°	0.140	0.21	-6.84	0.218	0.50	-3.00
50°	0.209	0.46	-3.40	0.997	10.44	10.19	230°	0.169	0.30	-5.22	0.258	0.70	-1.56
55°	0.230	0.56	-2.54	1.000	10.50	10.21	235°	0.204	0.44	-3.58	0.292	0.90	-0.48
60°	0.255	0.68	-1.66	1.000	10.50	10.21	240°	0.238	0.60	-2.25	0.317	1.05	0.23
65°	0.277	0.81	-0.93	1.000	10.50	10.21	245°	0.264	0.73	-1.35	0.332	1.16	0.64
70°	0.294	0.91	-0.42	1.000	10.50	10.21	250°	0.282	0.83	-0.80	0.338	1.20	0.79
75°	0.305	0.98	-0.10	1.000	10.50	10.21	255°	0.291	0.89	-0.52	0.339	1.21	0.83
80°	0.311	1.02	0.07	1.000	10.50	10.21	260°	0.291	0.89	-0.51	0.343	1.24	0.92
85°	0.311	1.01	0.06	0.999	10.49	10.21	265°	0.286	0.86	-0.67	0.349	1.28	1.08
90°	0.306	0.99	-0.06	0.996	10.41	10.18	270°	0.276	0.80	-0.96	0.358	1.34	1.29
95°	0.298	0.94	-0.29	0.989	10.28	10.12	275°	0.264	0.73	-1.37	0.369	1.43	1.55
100°	0.286	0.86	-0.65	0.980	10.08	10.04	280°	0.249	0.65	-1.88	0.382	1.53	1.85
105°	0.273	0.78	-1.06	0.968	9.83	9.93	285°	0.236	0.59	-2.33	0.395	1.64	2.15
110°	0.262	0.72	-1.43	0.952	9.52	9.79	290°	0.228	0.54	-2.65	0.406	1.73	2.39
115°	0.254	0.68	-1.69	0.934	9.16	9.62	295°	0.224	0.52	-2.80	0.415	1.81	2.57
120°	0.250	0.66	-1.81	0.913	8.75	9.42	300°	0.224	0.53	-2.78	0.421	1.86	2.69
125°	0.250	0.66	-1.82	0.889	8.30	9.19	305°	0.228	0.55	-2.63	0.425	1.89	2.77
130°	0.253	0.67	-1.73	0.862	7.80	8.92	310°	0.235	0.58	-2.35	0.426	1.91	2.80
135°	0.257	0.70	-1.57	0.832	7.27	8.61	315°	0.246	0.64	-1.97	0.429	1.93	2.86
140°	0.264	0.73	-1.34	0.799	6.70	8.26	320°	0.260	0.71	-1.48	0.437	2.01	3.03
145°	0.272	0.78	-1.10	0.763	6.12	7.86	325°	0.277	0.81	-0.94	0.451	2.13	3.29
150°	0.278	0.81	-0.91	0.723	5.50	7.40	330°	0.292	0.89	-0.49	0.469	2.31	3.63
155°	0.282	0.84	-0.77	0.676	4.80	6.81	335°	0.303	0.96	-0.16	0.492	2.55	4.06
160°	0.285	0.85	-0.70	0.626	4.12	6.14	340°	0.311	1.02	0.08	0.521	2.85	4.55
165°	0.283	0.84	-0.76	0.566	3.36	5.26	345°	0.316	1.05	0.22	0.555	3.23	5.09
170°	0.275	0.79	-1.01	0.504	2.67	4.26	350°	0.317	1.06	0.25	0.594	3.70	5.68
175°	0.260	0.71	-1.50	0.442	2.05	3.11	355°	0.311	1.02	0.07	0.638	4.27	6.30

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**0.318 @ 349° True**	**1.000 @ 55° True**
Minimum Field:	**0.109 @ 212° True**	**0.153 @ 207° True**
RMS:	**0.251**	**0.676**
Maximum ERP:	**1.060 kW**	**10.500 kW**
Maximum Power Gain:	**0.341 (-4.678 dB)**	**3.372 (5.279 dB)**

Total Input Power: 3.113 kW



Vertical polarization

Horizontal polarization

Envelope pattern

ERI® Horizontal Plane Relative Field Pattern

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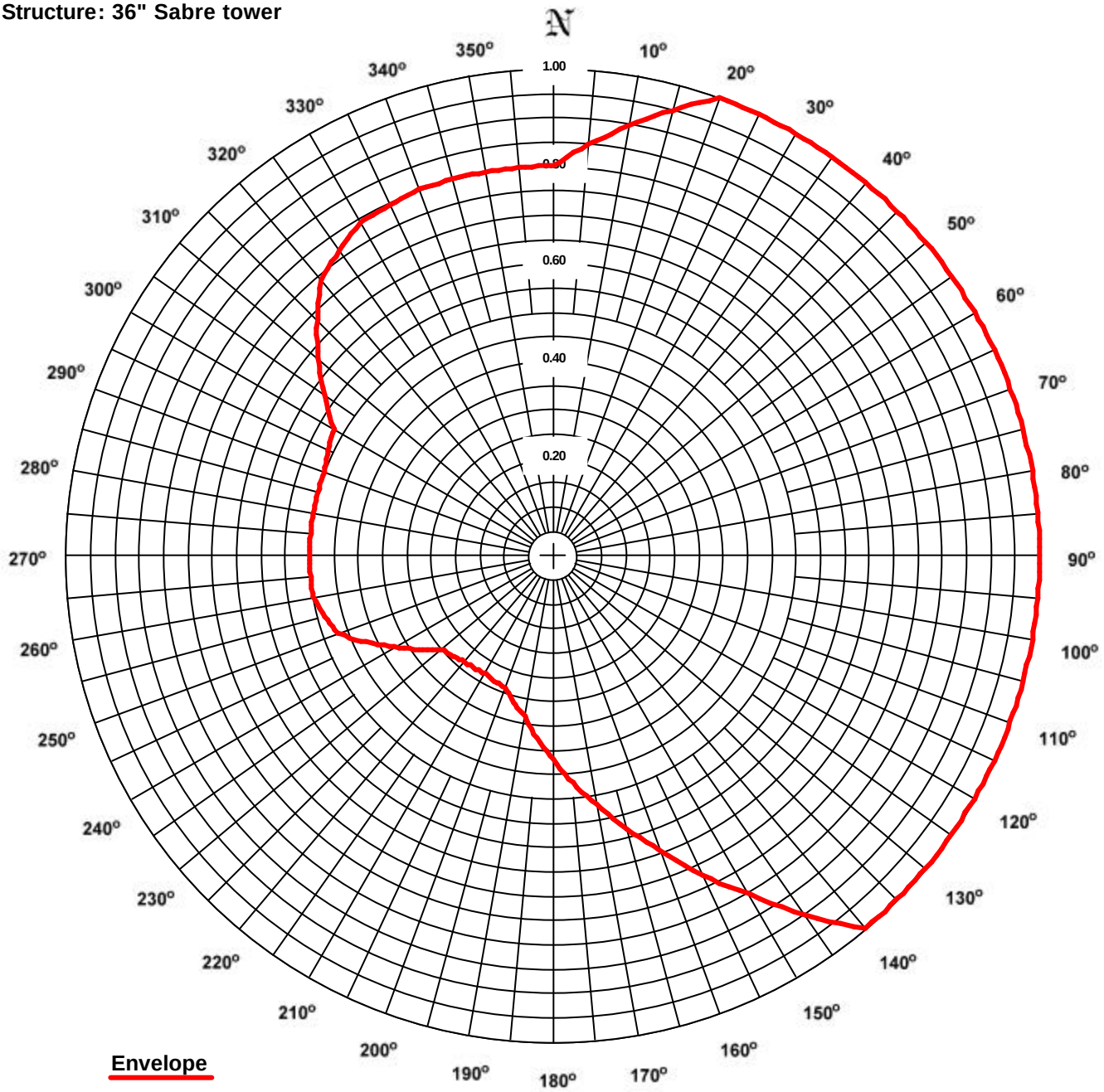
FIGURE NO: 4
STATION: WRTQ
LOCATION: OCEAN CITY, NEW JERSEY
ANTENNA: P300-2AE/37M-1E-DA-SP
Structure: 36" Sabre tower

DATE: 6/6/05
FREQUENCY: 106.5 MHz



Envelope

RMS: 0.761
Maximum: 1.000 @ 20° True
Minimum: 0.280 @ 210° True

COMMENTS: ENVELOPE PATTERN

ERI® Horizontal Plane Relative Field List

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com/

Station: WRTQ
Location: Ocean City, NJ
Frequency: 106.5 MHz

Antenna: P300-2AE/37M-1E-DA-SP
Tower: 36" Saber tower

Figure: 4
Date: 6/6/05
Reference: wrtq1e.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	0.800	6.72	8.27	H (and/or) V	180º	0.420	1.85	2.68	H (and/or) V
5º	0.848	7.54	8.77	H (and/or) V	185º	0.378	1.50	1.75	H (and/or) V
10º	0.895	8.41	9.25	H (and/or) V	190º	0.335	1.18	0.71	H (and/or) V
15º	0.948	9.43	9.74	H (and/or) V	195º	0.313	1.03	0.11	H (and/or) V
20º	1.000	10.50	10.21	H (and/or) V	200º	0.290	0.88	-0.54	H (and/or) V
25º	1.000	10.50	10.21	H (and/or) V	205º	0.285	0.85	-0.69	H (and/or) V
30º	1.000	10.50	10.21	H (and/or) V	210º	0.280	0.82	-0.84	H (and/or) V
35º	1.000	10.50	10.21	H (and/or) V	215º	0.283	0.84	-0.77	H (and/or) V
40º	1.000	10.50	10.21	H (and/or) V	220º	0.285	0.85	-0.69	H (and/or) V
45º	1.000	10.50	10.21	H (and/or) V	225º	0.293	0.90	-0.47	H (and/or) V
50º	1.000	10.50	10.21	H (and/or) V	230º	0.300	0.95	-0.25	H (and/or) V
55º	1.000	10.50	10.21	H (and/or) V	235º	0.338	1.20	0.78	H (and/or) V
60º	1.000	10.50	10.21	H (and/or) V	240º	0.375	1.48	1.69	H (and/or) V
65º	1.000	10.50	10.21	H (and/or) V	245º	0.423	1.87	2.73	H (and/or) V
70º	1.000	10.50	10.21	H (and/or) V	250º	0.470	2.32	3.65	H (and/or) V
75º	1.000	10.50	10.21	H (and/or) V	255º	0.485	2.47	3.93	H (and/or) V
80º	1.000	10.50	10.21	H (and/or) V	260º	0.500	2.63	4.19	H (and/or) V
85º	1.000	10.50	10.21	H (and/or) V	265º	0.500	2.63	4.19	H (and/or) V
90º	1.000	10.50	10.21	H (and/or) V	270º	0.500	2.63	4.19	H (and/or) V
95º	1.000	10.50	10.21	H (and/or) V	275º	0.500	2.63	4.19	H (and/or) V
100º	1.000	10.50	10.21	H (and/or) V	280º	0.500	2.63	4.19	H (and/or) V
105º	1.000	10.50	10.21	H (and/or) V	285º	0.500	2.63	4.19	H (and/or) V
110º	1.000	10.50	10.21	H (and/or) V	290º	0.500	2.63	4.19	H (and/or) V
115º	1.000	10.50	10.21	H (and/or) V	295º	0.510	2.73	4.36	H (and/or) V
120º	1.000	10.50	10.21	H (and/or) V	300º	0.520	2.84	4.53	H (and/or) V
125º	1.000	10.50	10.21	H (and/or) V	305º	0.575	3.47	5.41	H (and/or) V
130º	1.000	10.50	10.21	H (and/or) V	310º	0.630	4.17	6.20	H (and/or) V
135º	1.000	10.50	10.21	H (and/or) V	315º	0.685	4.93	6.93	H (and/or) V
140º	1.000	10.50	10.21	H (and/or) V	320º	0.740	5.75	7.60	H (and/or) V
145º	0.903	8.55	9.32	H (and/or) V	325º	0.765	6.14	7.89	H (and/or) V
150º	0.805	6.80	8.33	H (and/or) V	330º	0.790	6.55	8.16	H (and/or) V
155º	0.725	5.52	7.42	H (and/or) V	335º	0.795	6.64	8.22	H (and/or) V
160º	0.645	4.37	6.40	H (and/or) V	340º	0.800	6.72	8.27	H (and/or) V
165º	0.583	3.56	5.52	H (and/or) V	345º	0.800	6.72	8.27	H (and/or) V
170º	0.520	2.84	4.53	H (and/or) V	350º	0.800	6.72	8.27	H (and/or) V
175º	0.470	2.32	3.65	H (and/or) V	355º	0.800	6.72	8.27	H (and/or) V

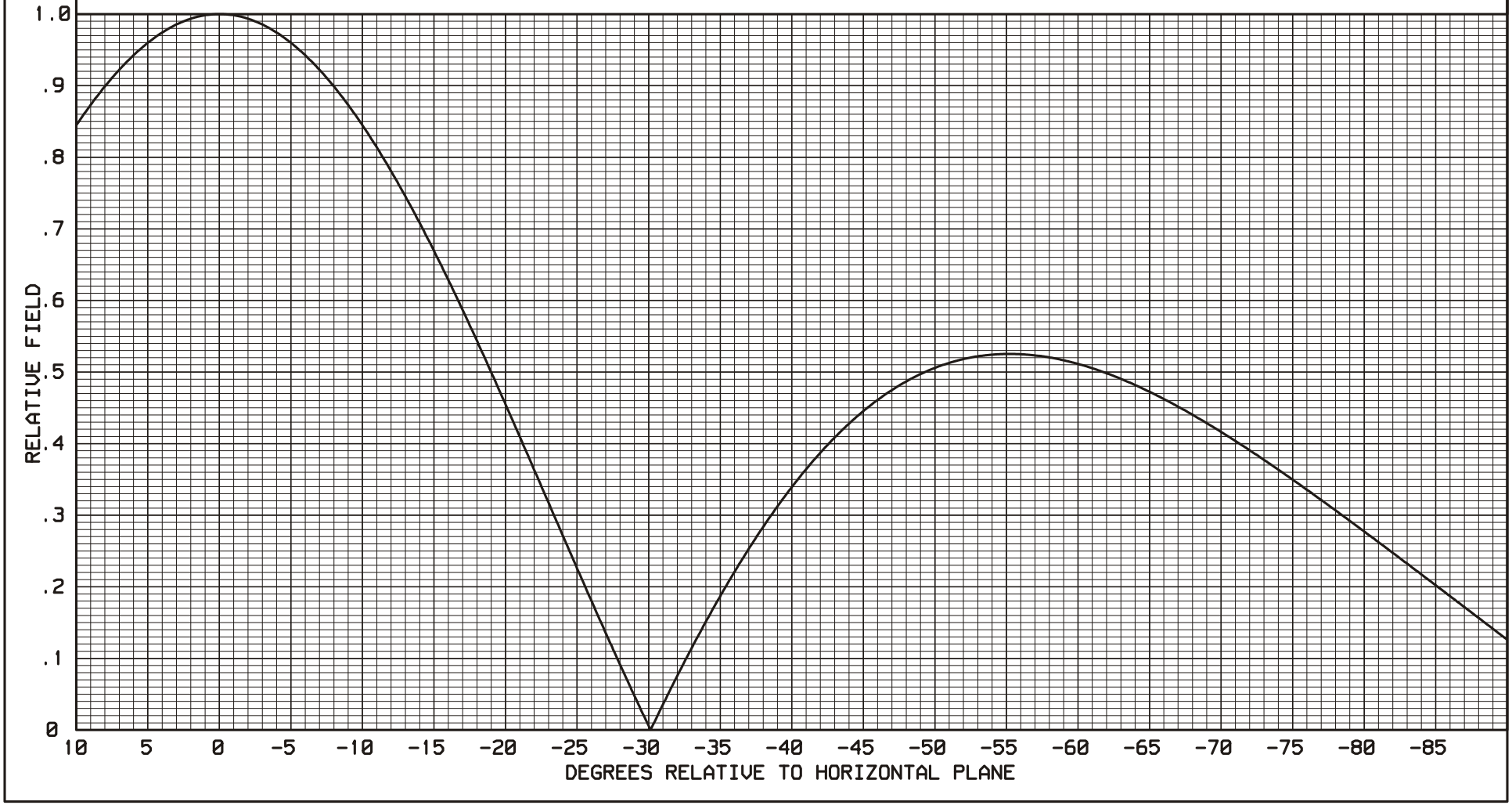
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

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

ERI TYPE P300-2B-DA
VERTICALLY POLARIZED ANTENNA
0 DEGREE ELECTRICAL BEAM TILT
0 PERCENT NULL FILL

ELEMENT SPACING:
1.0 WAVELENGTH

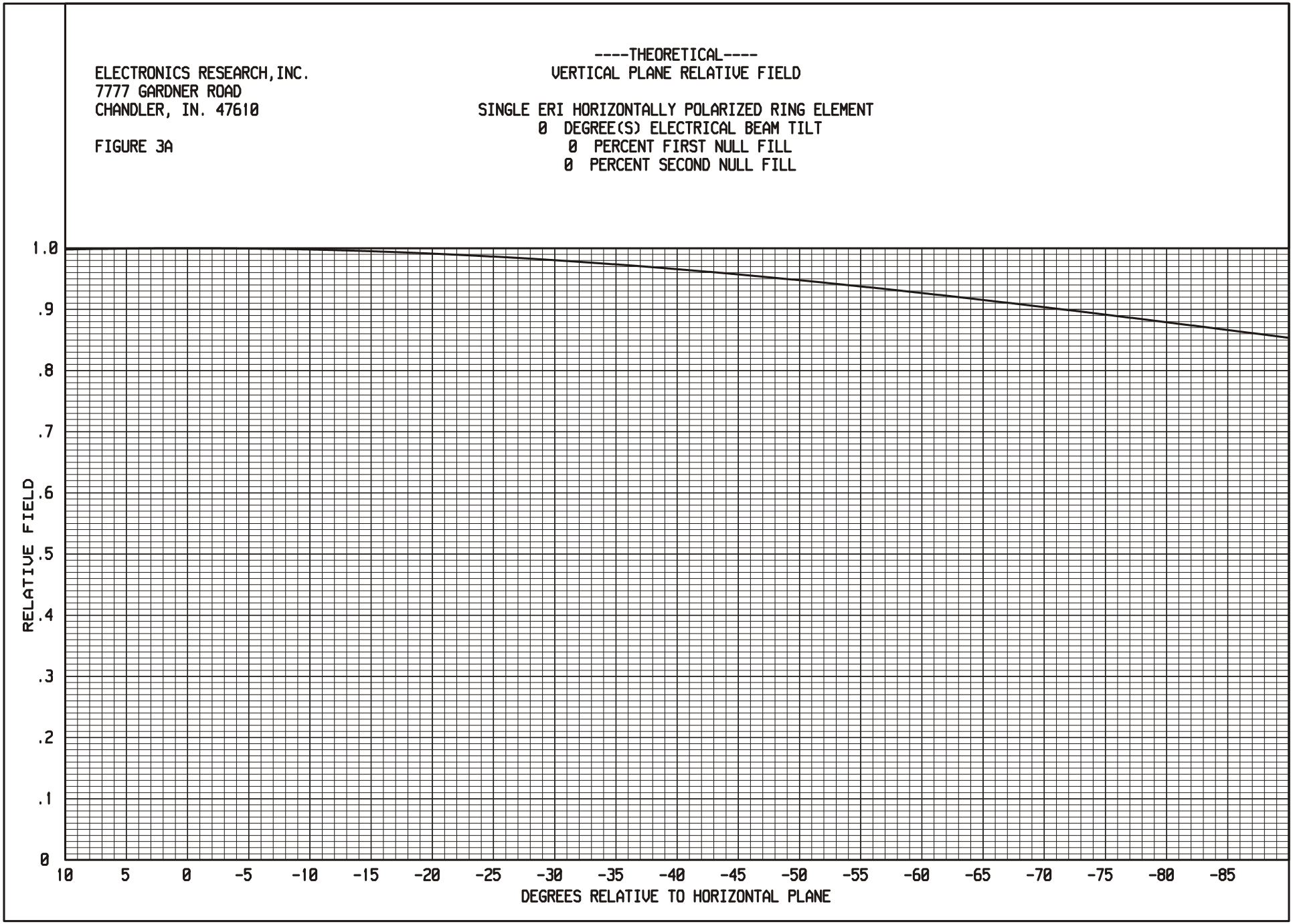


ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3A

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

SINGLE ERI HORIZONTALLY POLARIZED RING ELEMENT
0 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL



Directional Antenna System
for
WRTQ, Ocean City, New Jersey

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	P300-2AE/37M-1E-DA-SP
Frequency:	91.3 MHz
Number of Bays:	2

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	19 ft 5in
Aperture length required:	36 ft
Orientation:	74° true

Input flange to the antenna 3 1/8” female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	1.060 kW (0.253 dBk)
Horizontal maximum power gain:	0.341 (-4.678 dB)
Maximum vertical ERP:	10.5 kW (10.212 dBk)
Vertical maximum power gain:	3.372 (5.279 dB)
Total input power:	3.113 kW (4.932 dBk)

Top View of system