ERI® 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 KTKL, Stigler, Oklahoma

October 24, 2002

Electronics Research Inc. is providing a custom fabricated antenna system that is specially designed to meet the FCC requirements and the general needs of radio station KTKL.

The antenna is the ERI model P300-6B-DA configuration. The vertically polarized system consists of 6 full-wavelength spaced bays using one driven vertical dipole and two vertical parasitic elements per bay. The antenna was mounted on the North 177 degrees East tower face with bracketry to provide an antenna orientation of North 177 degrees East. The antenna was tested on a 36" face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 88.5 megahertz, which is the center of the FM broadcast channel assigned to KTKL.

Pattern measurements were made on a sixty-acre antenna pattern range that 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
KTKL, Stigler, Oklahoma

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of a two bay levels of the vertically 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. A section of 3 1/8 inch o.d. rigid coaxial line was used to feed the test antenna, and a section of 3 1/8 inch o.d. rigid outer conductor only was attached above the test antenna. The lines were properly grounded during all tests.

The power distribution and phase relationship to the antenna elements was adjusted in order to achieve the directional radiation patterns for the vertically polarized component.

The proof-of-performance was accomplished using a 36" face tower with identical dimension and configuration 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 structure 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.

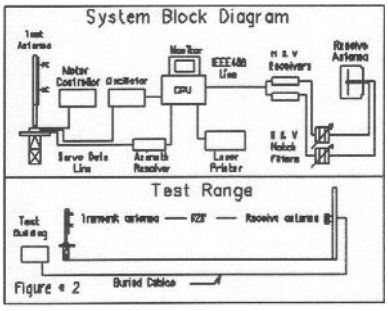


Figure # 2

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 88.5 MHz and was constantly monitored by an Anritsu Model ML521B measuring receiver.

A broad-band vertical dipole system, located approximately 628 feet from the test antenna, was used to receive the emitted test signals. The dipole system was mounted at the same height above terrain as the center of the antenna under test. The signals received by the dipole system were fed to the test building by way of a buried Heliax cable 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.

CONCLUSIONS

The vertically polarized system consists of 6 full-wavelength spaced bays using one driven vertical dipole and two vertical parasitic elements per bay. The power distribution and phase relationship will be fixed when antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The P300-6B-DA array is to be mounted on the North 177 degrees East tower face of the 36" face tower at a bearing of North 177 degrees East. 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.

Figure #1 represents the measured relative field value of the vertical component relative to azimuth. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 22 kilowatts (13.424 dBk).

The power at North 150 degrees East does not exceed 5.522 kilowatts (7.421 dBk).

The power at North 180-190 degrees East does not exceed 3.485 kilowatts (5.422 dBk).

The power at North 230 degrees East does not exceed 11.03 kilowatts (10.426 dBk).

The power at North 340 degrees East does not exceed 2.963 kilowatts (4.717 dBk).

The power at North 350 degrees East does not exceed 2.899 kilowatts (4.622 dBk).

Directional Antenna System
For
KTKL, Stigler, Oklahoma

(Continued)

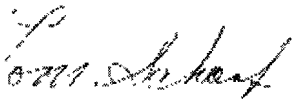
The vertical maximum relative field pattern obtained from the measured data as shown on Figure #1 has an RMS that is greater that 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 76 feet.

The directional antenna should not be mounted on the top of an antenna tower that includes a top-mounted platform larger than the cross-sectional area of the tower in the horizontal plane. No obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted 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. Metallic guy wires should be a minimum distance of forty feet horizontally from the antenna.

The calculated maximum power gain of the vertical pattern as shown on Figure # 1 is 14.834 (11.713dB), which would require an input power of 1.483 kilowatts.

ELECTRONICS RESEARCH, INC.



ERI® Horizontal Plane Relative Field Pattern

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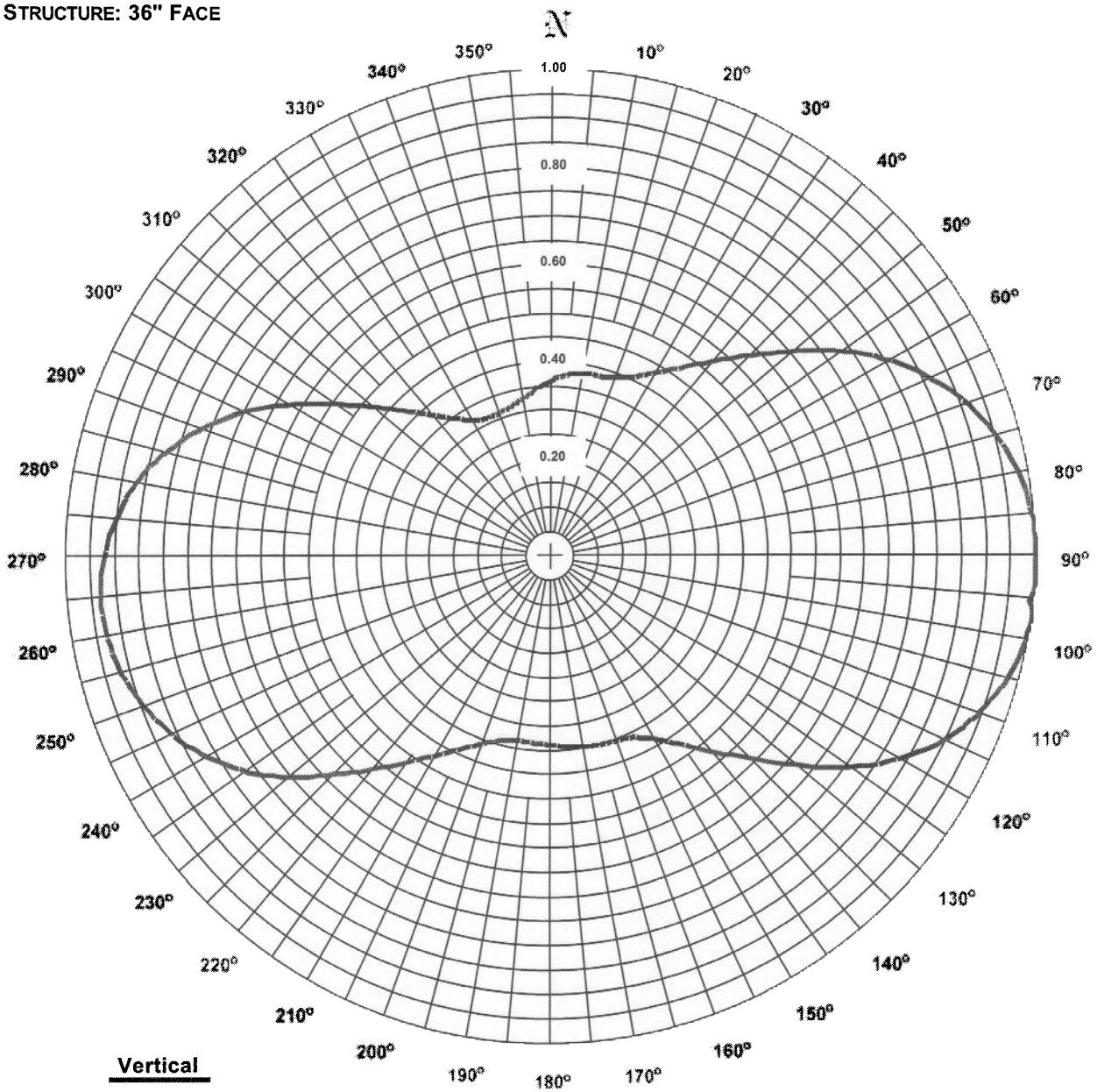
FIGURE: 1
STATION: KTKL
LOCATION: STIGLER OK.
ANTENNA TYPE: P-300-6B-DA
STRUCTURE: 36" FACE

DATE: 10/23/02
FREQUENCY: 88.5 MHZ
ORIENTATION: 177° TRUE
MOUNTING: CUSTOM



Vertical

RMS: 0.660
Maximum: 1.000 @ 89° True
Minimum: 0.316 @ 337° True

COMMENTS: THIS PATTERN SHOWS THE MEASURED MAXIMUM OF THE VERTICAL AZIMUTH VALUES. THIS PATTERN DOES NOT EXCEED THE FCC FILED COMPOSITE PATTERN AT ANY AZIMUTH. THE RMS OF THIS PATTERN IS GREATER THAN 85% OF THE FILED FCC COMPOSITE PATTERN BNPED-19991004AAH.

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: KTKL
Location: Stigler Ok.
Frequency: 88.5 MHz

Antenna: P-300-6B-DA
Orientation: 177° True
Tower: 36" Face

Figure: 1
Date: 10/23/02
Reference: ktkl1m.fig

Angle	Values			Polarization	Angle	Values			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.366	2.95	4.69	Vertical	180°	0.384	3.24	5.11	Vertical
5°	0.378	3.15	4.98	Vertical	185°	0.381	3.19	5.04	Vertical
10°	0.386	3.28	5.16	Vertical	190°	0.381	3.19	5.03	Vertical
15°	0.389	3.33	5.22	Vertical	195°	0.388	3.31	5.20	Vertical
20°	0.396	3.44	5.37	Vertical	200°	0.405	3.60	5.57	Vertical
25°	0.413	3.75	5.74	Vertical	205°	0.431	4.08	6.11	Vertical
30°	0.441	4.28	6.32	Vertical	210°	0.466	4.78	6.79	Vertical
35°	0.480	5.07	7.05	Vertical	215°	0.511	5.73	7.58	Vertical
40°	0.530	6.19	7.91	Vertical	220°	0.564	7.01	8.45	Vertical
45°	0.591	7.69	8.86	Vertical	225°	0.627	8.66	9.38	Vertical
50°	0.663	9.66	9.85	Vertical	230°	0.700	10.78	10.32	Vertical
55°	0.741	12.09	10.83	Vertical	235°	0.763	12.79	11.07	Vertical
60°	0.811	14.47	11.60	Vertical	240°	0.816	14.63	11.65	Vertical
65°	0.870	16.64	12.21	Vertical	245°	0.859	16.22	12.10	Vertical
70°	0.917	18.52	12.68	Vertical	250°	0.892	17.51	12.43	Vertical
75°	0.954	20.04	13.02	Vertical	255°	0.916	18.44	12.66	Vertical
80°	0.980	21.15	13.25	Vertical	260°	0.929	19.00	12.79	Vertical
85°	0.996	21.81	13.39	Vertical	265°	0.933	19.14	12.82	Vertical
90°	1.000	22.00	13.42	Vertical	270°	0.924	18.77	12.74	Vertical
95°	0.989	21.50	13.32	Vertical	275°	0.903	17.96	12.54	Vertical
100°	0.994	21.75	13.37	Vertical	280°	0.872	16.73	12.23	Vertical
105°	0.974	20.89	13.20	Vertical	285°	0.829	15.12	11.80	Vertical
110°	0.940	19.45	12.89	Vertical	290°	0.775	13.21	11.21	Vertical
115°	0.892	17.49	12.43	Vertical	295°	0.710	11.08	10.44	Vertical
120°	0.829	15.12	11.80	Vertical	300°	0.633	8.81	9.45	Vertical
125°	0.752	12.44	10.95	Vertical	305°	0.554	6.75	8.30	Vertical
130°	0.663	9.67	9.86	Vertical	310°	0.486	5.21	7.17	Vertical
135°	0.583	7.49	8.74	Vertical	315°	0.430	4.07	6.10	Vertical
140°	0.518	5.90	7.71	Vertical	320°	0.385	3.26	5.13	Vertical
145°	0.467	4.79	6.80	Vertical	325°	0.351	2.71	4.33	Vertical
150°	0.429	4.06	6.08	Vertical	330°	0.329	2.38	3.76	Vertical
155°	0.407	3.64	5.61	Vertical	335°	0.317	2.22	3.46	Vertical
160°	0.398	3.49	5.42	Vertical	340°	0.317	2.21	3.45	Vertical
165°	0.397	3.47	5.40	Vertical	345°	0.323	2.29	3.61	Vertical
170°	0.394	3.41	5.33	Vertical	350°	0.333	2.45	3.89	Vertical
175°	0.389	3.32	5.21	Vertical	355°	0.349	2.68	4.28	Vertical

Polarization: **Envelope**
Maximum Field: **1.000 @ 89° True**
Minimum Field: **0.316 @ 337° True**
RMS: **0.660**
Maximum ERP: **22.000 kW**
Maximum Power Gain: **14.834 (11.713dB)**

Total Input Power: 1.483 kW

Directional Antenna System
for
KTKL, Stigler, Oklahoma

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	P300-6B-DA
Frequency:	88.5 MHz
Number of Bays:	6

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	64 ft 4 in
Aperture length required:	76 ft.
Orientation:	177° true

Input flange to the antenna 3 1/8 inch female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum vertical ERP:	22 kW (13.424 dBk)
Vertical maximum power gain:	14.834 (11.713 dB)
Total input power:	1.483 kW (1.712 dBk)