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 KWDS, Kettleman City, California

November 15, 2005

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 KWDS.

The antenna is the ERI model P300-4BC-DA configuration. The vertically polarized system consists of 4 full-wavelength spaced bays using one driven vertical dipole and two vertical parasitic elements per bay. The antenna was mounted on the North 81 degrees East tower face with bracketry to provide an antenna orientation of North 103 degrees East. The antenna was tested on a 53" face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 89.9 megahertz, which is the center of the FM broadcast channel assigned to KWDS.

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.

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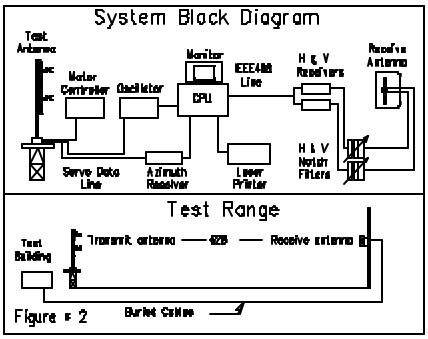
(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of a two bays 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 the vertical polarization component.

The proof-of-performance was accomplished using a 53" 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.



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

A broadband vertical dipole system, located approximately 628 feet form 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 4 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 P300-4BC-DA array is to be mounted on the North 81 degrees East tower face of the 53" face tower at a bearing of North 103 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 50 kilowatts (16.99 dBk).

The power at North 330 degrees East does not exceed 7.7 kilowatts (8.865 dBk).

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 52 feet 8 inches.

(Continued)

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.

ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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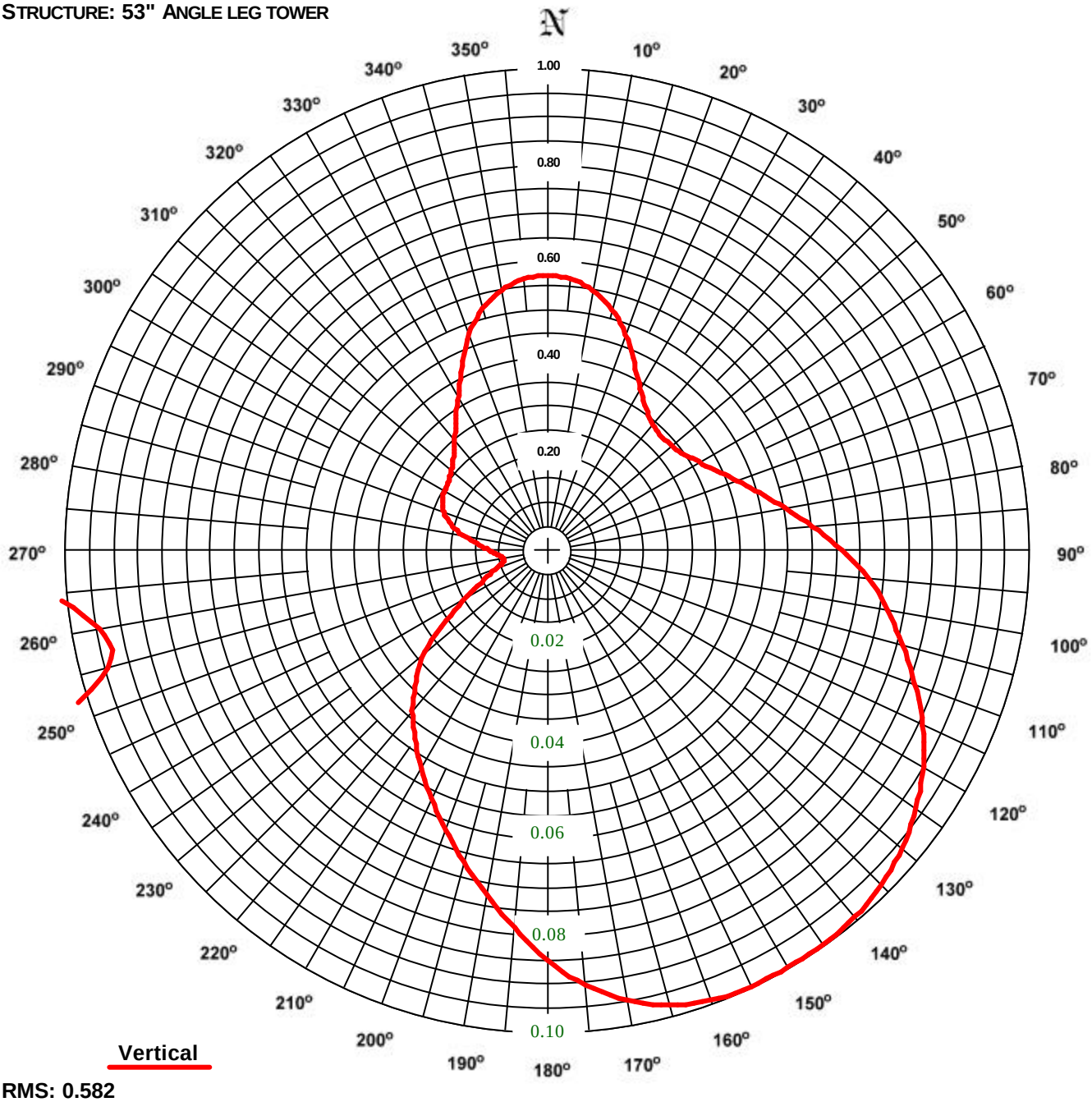
FIGURE: 1
STATION: KWDS
LOCATION: KETTLEMAN CITY, CA
ANTENNA TYPE: P300-4BC-DA
STRUCTURE: 53" ANGLE LEG TOWER

DATE: 11/14/2005
FREQUENCY: 89.9 MHZ
ORIENTATION: 103° TRUE
MOUNTING: CUSTOM



Vertical

RMS: 0.582
Maximum: 1.000 @ 146° True
Minimum: 0.093 @ 257° True

10X Scale

COMMENTS: MEASURED PATTERN OF THE VERTICAL COMPONENT. COMPOSITE PATTERN: THIS PATTERN SHOWS THE MAXIMUM OF EITHER THE VERTICAL AZIMUTH VALUES. THIS PATTERN IS GREATER THAT 85% OF THE FCC FILED COMPOSITE PATTERN BMPED-20050202AFK

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: KWDS
Location: Kettleman City, CA
Frequency: 89.9 MHz

Antenna: P300-4BC-DA
Orientation: 103° True
Tower: 53" Angle leg tower

Figure: 1
Date: 11/14/2005
Reference: kwds1m.fig

Angle	Pattern Data			Polarization	Angle	Pattern Data			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	0.571	16.30	12.12	Vertical	180º	0.852	36.30	15.60	Vertical
5º	0.564	15.92	12.02	Vertical	185º	0.787	30.97	14.91	Vertical
10º	0.546	14.92	11.74	Vertical	190º	0.727	26.43	14.22	Vertical
15º	0.517	13.36	11.26	Vertical	195º	0.671	22.50	13.52	Vertical
20º	0.476	11.35	10.55	Vertical	200º	0.619	19.16	12.82	Vertical
25º	0.427	9.13	9.61	Vertical	205º	0.570	16.22	12.10	Vertical
30º	0.387	7.48	8.74	Vertical	210º	0.524	13.73	11.38	Vertical
35º	0.358	6.39	8.06	Vertical	215º	0.478	11.42	10.58	Vertical
40º	0.340	5.77	7.61	Vertical	220º	0.436	9.50	9.78	Vertical
45º	0.333	5.54	7.43	Vertical	225º	0.385	7.43	8.71	Vertical
50º	0.337	5.67	7.54	Vertical	230º	0.331	5.46	7.37	Vertical
55º	0.347	6.04	7.81	Vertical	235º	0.256	3.29	5.17	Vertical
60º	0.365	6.66	8.23	Vertical	240º	0.193	1.86	2.70	Vertical
65º	0.389	7.56	8.79	Vertical	245º	0.144	1.03	0.14	Vertical
70º	0.420	8.80	9.45	Vertical	250º	0.111	0.62	-2.11	Vertical
75º	0.457	10.44	10.19	Vertical	255º	0.095	0.45	-3.50	Vertical
80º	0.501	12.55	10.99	Vertical	260º	0.094	0.45	-3.50	Vertical
85º	0.553	15.29	11.85	Vertical	265º	0.104	0.54	-2.67	Vertical
90º	0.611	18.64	12.70	Vertical	270º	0.121	0.74	-1.33	Vertical
95º	0.669	22.39	13.50	Vertical	275º	0.147	1.08	0.32	Vertical
100º	0.717	25.72	14.10	Vertical	280º	0.179	1.61	2.06	Vertical
105º	0.763	29.12	14.64	Vertical	285º	0.208	2.16	3.34	Vertical
110º	0.812	32.97	15.18	Vertical	290º	0.228	2.61	4.17	Vertical
115º	0.860	36.98	15.68	Vertical	295º	0.241	2.91	4.63	Vertical
120º	0.901	40.58	16.08	Vertical	300º	0.246	3.02	4.80	Vertical
125º	0.935	43.69	16.40	Vertical	305º	0.250	3.11	4.93	Vertical
130º	0.962	46.23	16.65	Vertical	310º	0.259	3.36	5.26	Vertical
135º	0.981	48.15	16.83	Vertical	315º	0.275	3.78	5.78	Vertical
140º	0.994	49.41	16.94	Vertical	320º	0.299	4.46	6.49	Vertical
145º	1.000	49.97	16.99	Vertical	325º	0.331	5.48	7.39	Vertical
150º	1.000	50.00	16.99	Vertical	330º	0.369	6.81	8.33	Vertical
155º	1.000	50.00	16.99	Vertical	335º	0.420	8.82	9.45	Vertical
160º	0.995	49.51	16.95	Vertical	340º	0.478	11.42	10.58	Vertical
165º	0.978	47.80	16.79	Vertical	345º	0.518	13.41	11.27	Vertical
170º	0.948	44.95	16.53	Vertical	350º	0.547	14.94	11.74	Vertical
175º	0.906	41.07	16.13	Vertical	355º	0.564	15.92	12.02	Vertical

Polarization: **Vertical**
Maximum Field: **1.000 @ 146° True**
Minimum Field: **0.093 @ 257° True**
RMS: **0.582**
Maximum ERP: **50.000 kW**
Maximum Power Gain: **12.464 (10.957 dB)**

Total Input Power: 4.012 kW

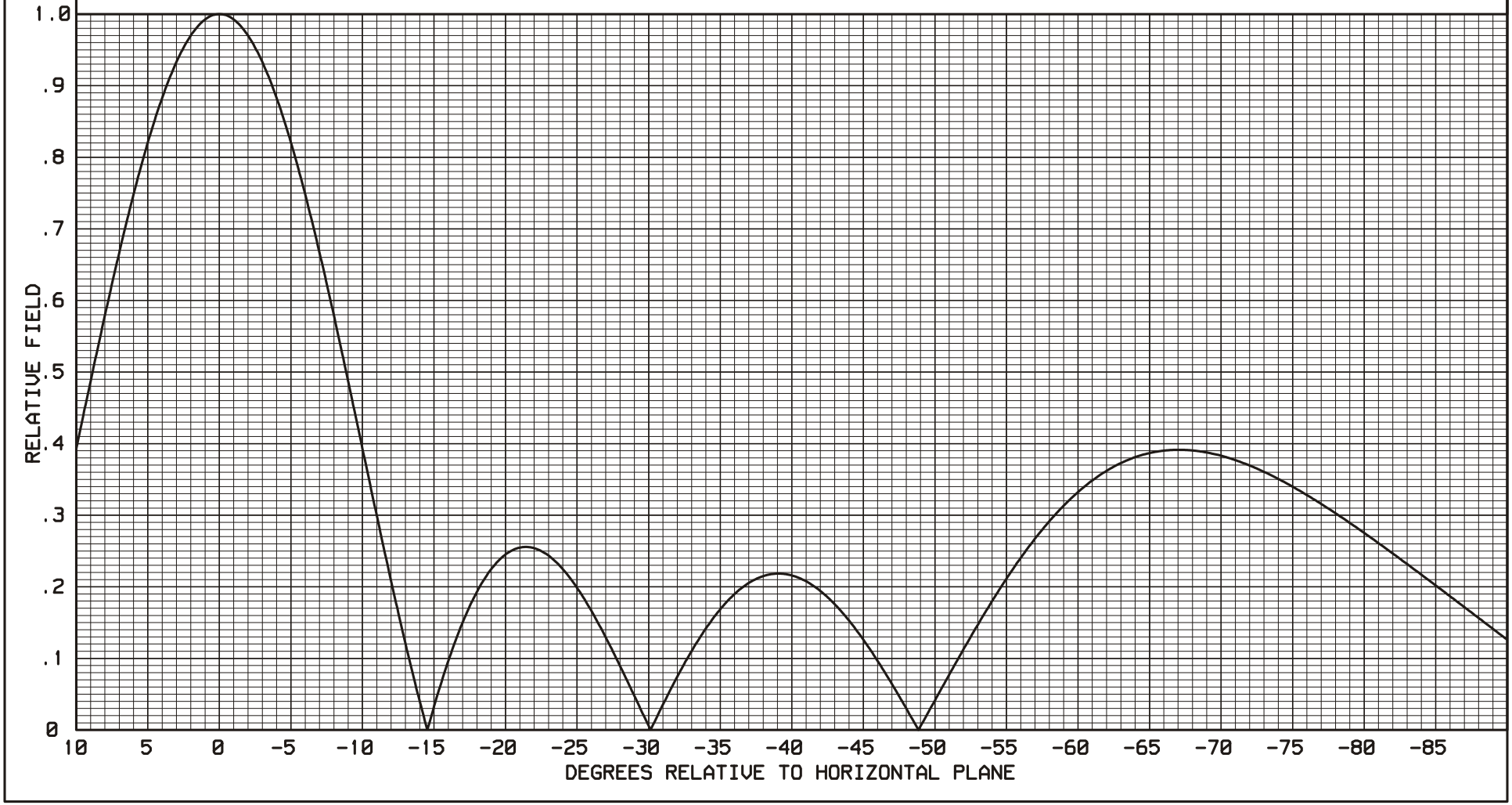
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

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

4 ERI TYPE P-300 VERTICALLY POLARIZED DIPOLES
0 DEGREE ELECTRICAL BEAM TILT
0 PERCENT NULL FILL

ELEMENT SPACING:
1.0 WAVELENGTH



Directional Antenna System
for
KWDS, Kettleman City, California

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	P300-4BC-DA
Frequency:	89.9 MHz
Number of Bays:	Four

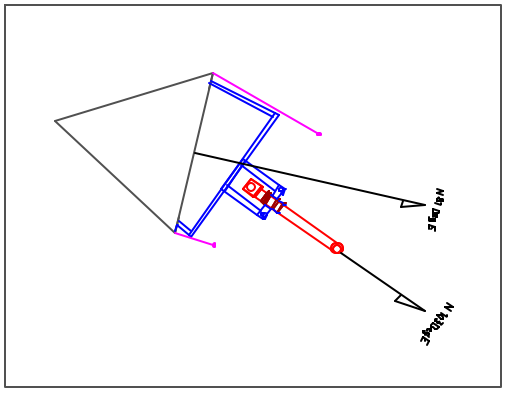
MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	36 ft 8 in
Aperture length required:	52 ft 8 in
Orientation:	103° true

Input flange to the antenna 3 1/8 inch female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum vertical ERP:	50 kW (16.99 dBk)
Vertical maximum power gain:	12.464 (10.957 dB)
Total input power:	4.012 kW (6.033 dBk)



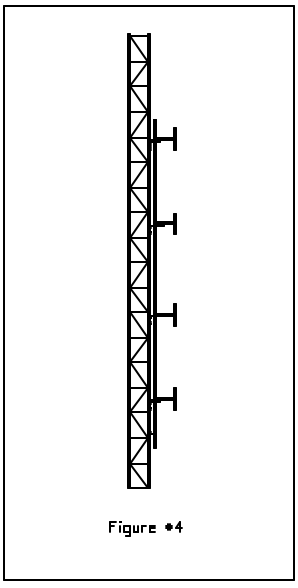


Figure #4