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 WUCF, Orlando, Florida

February 14, 2003

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 WUCF.

The antenna is the E.R.I. P300-1B-DA/FM11-SP configuration. The vertically polarized directional system consists of one bay using one driven vertical dipole and five vertical parasitic elements at bay level. The omni-directional horizontally polarized component consists of one bay using one driven horizontal ring antenna. The antenna was tested on a 12 3/4" o.d. pole, 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 WUCF.

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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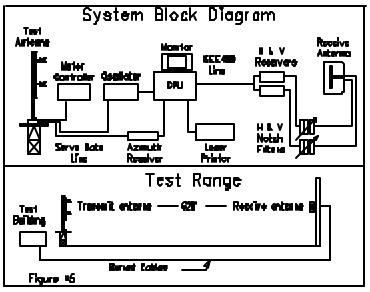
DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of the complete 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 pattern for the vertically polarized component.

The proof-of-performance was accomplished using a 12 3/4" o.d. pole 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 broad-band vertical dipole system, located approximately 628 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 directional system consists of one bay using one driven vertical dipole and five vertical parasitic elements. The omni-directional horizontally polarized component consists of one bay using one driven horizontal ring antenna. 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 P300-1B-DA/FM11-SP array is to be mounted on the 12 3/4" o.d. pole at a bearing of North 266 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 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 5.6 kilowatts (7.482 dBk).

The power at North 140-160 degrees East does not exceed 0.767 kilowatts (-1.152 dBk).

The power at North 350 degrees East does not exceed 0.647 kilowatts (-1.891 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.

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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.

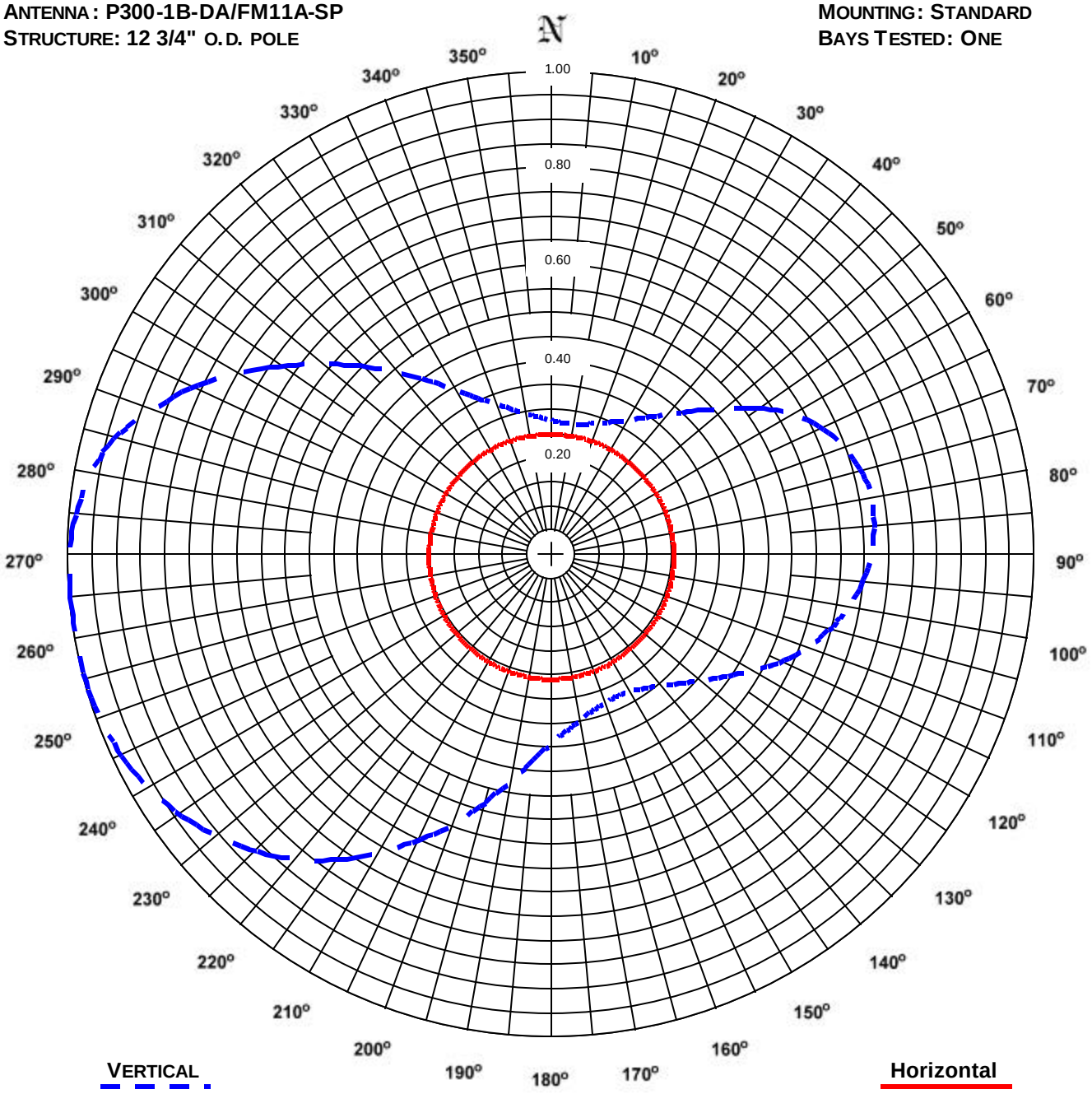
ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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: WUCF
LOCATION: ORLANDO, FL
ANTENNA: P300-1B-DA/FM11A-SP
STRUCTURE: 12 3/4" O.D. POLE

DATE: 2/14/03
FREQUENCY: 89.9 MHZ
ORIENTATION: 266° TRUE
MOUNTING: STANDARD
BAYS TESTED: ONE



VERTICAL

RMS: 0.620
MAXIMUM: 1.000 @ 257° TRUE
MINIMUM: 0.279 @ 7° TRUE

Horizontal

RMS: 0.254
Maximum: 0.254 @ 0° True
Minimum: 0.254 @ 0° True

COMMENTS: MEASURED PATTERN OF THE VERTICAL COMPONENT: THIS PATTERN SHOWS THE MAXIMUM OF THE V 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 BPED-19990429MD.

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: WUCF
Location: Orlando, FL
Frequency: 89.9 MHz

Antenna: P300-1B-DA/FM11A-SP
Orientation: 266° True
Tower: 12 3/4" o.d. pole

Figure: 1
Date: 2/14/03
Reference: wucf1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0º	0.254	0.36	-4.44	0.283	0.45	-3.48	180º	0.254	0.36	-4.44	0.387	0.84	-0.76
5º	0.254	0.36	-4.44	0.279	0.44	-3.60	185º	0.254	0.36	-4.44	0.424	1.01	0.03
10º	0.254	0.36	-4.44	0.280	0.44	-3.58	190º	0.254	0.36	-4.44	0.469	1.23	0.91
15º	0.254	0.36	-4.44	0.285	0.46	-3.42	195º	0.254	0.36	-4.44	0.526	1.55	1.91
20º	0.254	0.36	-4.44	0.295	0.49	-3.13	200º	0.254	0.36	-4.44	0.588	1.94	2.87
25º	0.254	0.36	-4.44	0.309	0.53	-2.72	205º	0.254	0.36	-4.44	0.646	2.34	3.69
30º	0.254	0.36	-4.44	0.329	0.60	-2.19	210º	0.254	0.36	-4.44	0.706	2.79	4.46
35º	0.254	0.36	-4.44	0.354	0.70	-1.53	215º	0.254	0.36	-4.44	0.765	3.28	5.16
40º	0.254	0.36	-4.44	0.387	0.84	-0.77	220º	0.254	0.36	-4.44	0.817	3.74	5.73
45º	0.254	0.36	-4.44	0.428	1.03	0.12	225º	0.254	0.36	-4.44	0.863	4.17	6.20
50º	0.254	0.36	-4.44	0.478	1.28	1.07	230º	0.254	0.36	-4.44	0.902	4.55	6.58
55º	0.254	0.36	-4.44	0.536	1.61	2.07	235º	0.254	0.36	-4.44	0.934	4.89	6.89
60º	0.254	0.36	-4.44	0.585	1.92	2.83	240º	0.254	0.36	-4.44	0.960	5.16	7.13
65º	0.254	0.36	-4.44	0.623	2.18	3.37	245º	0.254	0.36	-4.44	0.980	5.37	7.30
70º	0.254	0.36	-4.44	0.651	2.37	3.75	250º	0.254	0.36	-4.44	0.993	5.52	7.42
75º	0.254	0.36	-4.44	0.668	2.50	3.97	255º	0.254	0.36	-4.44	0.999	5.59	7.48
80º	0.254	0.36	-4.44	0.674	2.54	4.06	260º	0.254	0.36	-4.44	1.000	5.60	7.48
85º	0.254	0.36	-4.44	0.670	2.52	4.01	265º	0.254	0.36	-4.44	1.000	5.60	7.48
90º	0.254	0.36	-4.44	0.661	2.44	3.88	270º	0.254	0.36	-4.44	0.999	5.59	7.47
95º	0.254	0.36	-4.44	0.645	2.33	3.67	275º	0.254	0.36	-4.44	0.989	5.48	7.39
100º	0.254	0.36	-4.44	0.622	2.17	3.36	280º	0.254	0.36	-4.44	0.969	5.26	7.21
105º	0.254	0.36	-4.44	0.594	1.98	2.96	285º	0.254	0.36	-4.44	0.938	4.92	6.92
110º	0.254	0.36	-4.44	0.560	1.76	2.44	290º	0.254	0.36	-4.44	0.883	4.37	6.40
115º	0.254	0.36	-4.44	0.519	1.51	1.79	295º	0.254	0.36	-4.44	0.825	3.82	5.82
120º	0.254	0.36	-4.44	0.474	1.26	1.00	300º	0.254	0.36	-4.44	0.759	3.23	5.09
125º	0.254	0.36	-4.44	0.434	1.05	0.22	305º	0.254	0.36	-4.44	0.688	2.65	4.23
130º	0.254	0.36	-4.44	0.399	0.89	-0.49	310º	0.254	0.36	-4.44	0.623	2.17	3.37
135º	0.254	0.36	-4.44	0.371	0.77	-1.13	315º	0.254	0.36	-4.44	0.559	1.75	2.43
140º	0.254	0.36	-4.44	0.349	0.68	-1.67	320º	0.254	0.36	-4.44	0.501	1.41	1.48
145º	0.254	0.36	-4.44	0.333	0.62	-2.07	325º	0.254	0.36	-4.44	0.447	1.12	0.48
150º	0.254	0.36	-4.44	0.323	0.58	-2.33	330º	0.254	0.36	-4.44	0.400	0.90	-0.48
155º	0.254	0.36	-4.44	0.320	0.57	-2.42	335º	0.254	0.36	-4.44	0.364	0.74	-1.31
160º	0.254	0.36	-4.44	0.323	0.59	-2.32	340º	0.254	0.36	-4.44	0.336	0.63	-2.00
165º	0.254	0.36	-4.44	0.332	0.62	-2.11	345º	0.254	0.36	-4.44	0.317	0.56	-2.50
170º	0.254	0.36	-4.44	0.344	0.66	-1.78	350º	0.254	0.36	-4.44	0.302	0.51	-2.92
175º	0.254	0.36	-4.44	0.362	0.73	-1.34	355º	0.254	0.36	-4.44	0.290	0.47	-3.26

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**0.254 @ 0° True**	**1.000 @ 257° True**
Minimum Field:	**0.254 @ 0° True**	**0.279 @ 7° True**
RMS:	**0.254**	**0.620**
Maximum ERP:	**0.360 kW**	**5.600 kW**
Maximum Power Gain:	**0.132 (-8.810 dB)**	**2.046 (3.109 dB)**

Total Input Power: 2.737kW

Directional Antenna System
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(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	P300-1B-DA/FM11-SP
Frequency:	89.9 MHz
Number of Bays:	1

MECHANICAL SPECIFICATIONS

Mounting:	Standard
Orientation:	266° true

Input flange to the antenna 1 5/8 inch female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	0.36 kW (-4.437 dBk)
Horizontal maximum power gain:	0.132 (-8.810 dB)
Maximum vertical ERP:	5.6 kW (7.482 dBk)
Vertical maximum power gain:	2.046 (3.109 dB)
Total input power:	2.737 kW (4.373 dBk)