

***Directional Antenna System
for
WAYV, Atlantic City New Jersey***

October 15, 2001

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 WAYV.

The antenna is the ERI model MP-5E-DA-HW configuration. The circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay and two vertical parasitic elements per bay. The antenna was tested on a 10 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 95.1 megahertz which is the center of the FM broadcast channel assigned to WAYV.

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 WAYV, Atlantic City New Jersey

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

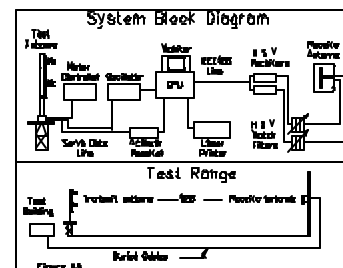
The test antenna consisted of two bay levels of the circular polarized system with the associated vertical parasitic elements. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna. A section of 3 1/8 inch o.d. rigid coaxial 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 both horizontal and vertical polarization components.

The proof-of-performance was accomplished using a 10 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 95.1 MHz 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, 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 two buried Heliac 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.



Directional Antenna System
For
WAYV, Atlantic City New Jersey

(Continued)

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 circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay 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 MP-5E-DA-HW array is to be mounted on the 10 3/4" o.d. pole at a bearing of North 286 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 maximum value of either the horizontal or vertical component at any azimuth. The measured horizontal plane relative field pattern, for both the horizontal and vertical polarization components, is shown on Figure #2 attached. The actual measured pattern does not exceed the authorized FCC composite pattern at any 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 266 degrees East does not exceed 20 kilowatts (13.01 dBk).

The power at North 307 degrees East does not exceed 28 kilowatts (14.472 dBk).

The power at North 332 degrees East does not exceed 40 kilowatts (16.021 dBk).

The RMS of the vertically polarized horizontal plane component does not exceed the RMS of the horizontally polarized horizontal plane component.

Directional Antenna System
For
WAYV, Atlantic City New Jersey

(Continued)

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

The clear vertical length of the structure required to support the antenna is 36 feet if the antenna is to be top mounted.

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.

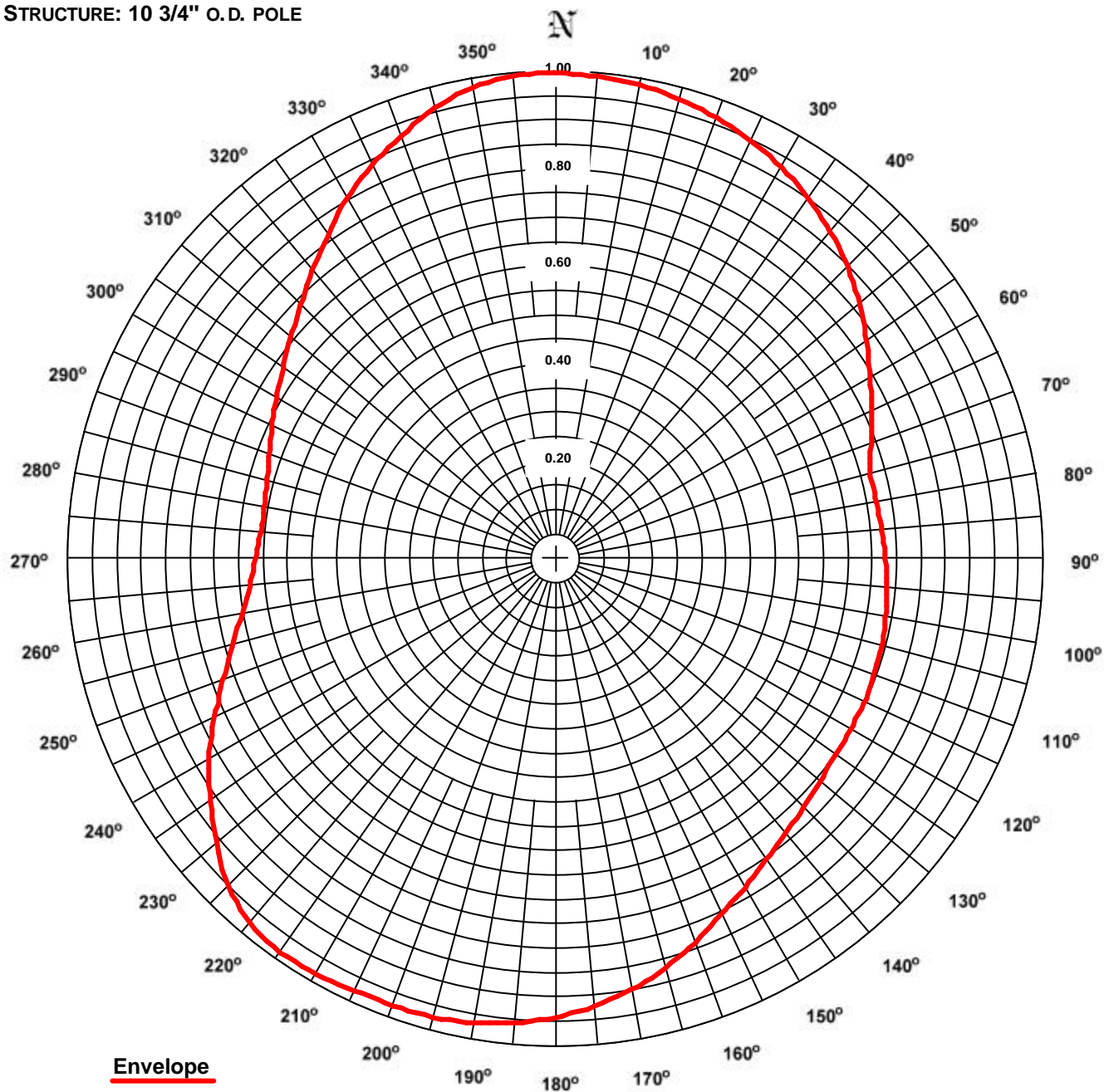
ELECTRONICS RESEARCH, INC.

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: 1
STATION: WAYV
LOCATION: ATLANTIC CITY, N.J.
ANTENNA TYPE: MP-5E-DA-HW
STRUCTURE: 10 3/4" O.D. POLE

DATE: 10/15/01
FREQUENCY: 95.1 MHz
ORIENTATION: 286° TRUE
MOUNTING: STANDARD



RMS: 0.818
Maximum: 1.000 @ 358° True
Minimum: 0.606 @ 278° True

COMMENTS: COMPOSITE PATTERN: THIS PATTERN SHOWS THE MAXIMUM OF EITHER THE H OR 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 BLH-880404KA.

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: WAYV
Location: Atlantic City, N.J.
Frequency: 95.1 MHz

Antenna: MP-5E-DA-HW
Orientation: 286° True
Tower: 10 3/4" o.d. pole

Figure: 1
Date: 10/15/01
Reference: wayv1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	1.000	49.96	16.99	Horizontal	180°	0.939	44.04	16.44	Vertical
5°	0.996	49.63	16.96	Horizontal	185°	0.954	45.48	16.58	Vertical
10°	0.990	48.96	16.90	Horizontal	190°	0.965	46.52	16.68	Vertical
15°	0.980	47.97	16.81	Horizontal	195°	0.971	47.17	16.74	Vertical
20°	0.966	46.67	16.69	Horizontal	200°	0.974	47.42	16.76	Vertical
25°	0.949	45.07	16.54	Horizontal	205°	0.976	47.61	16.78	Horizontal
30°	0.929	43.18	16.35	Horizontal	210°	0.981	48.12	16.82	Horizontal
35°	0.906	41.03	16.13	Horizontal	215°	0.983	48.31	16.84	Horizontal
40°	0.879	38.64	15.87	Horizontal	220°	0.974	47.39	16.76	Horizontal
45°	0.849	36.04	15.57	Horizontal	225°	0.948	44.96	16.53	Horizontal
50°	0.815	33.25	15.22	Horizontal	230°	0.907	41.10	16.14	Horizontal
55°	0.780	30.38	14.83	Horizontal	235°	0.864	37.31	15.72	Horizontal
60°	0.746	27.83	14.44	Horizontal	240°	0.821	33.71	15.28	Horizontal
65°	0.716	25.63	14.09	Horizontal	245°	0.772	29.80	14.74	Horizontal
70°	0.689	23.74	13.76	Horizontal	250°	0.726	26.38	14.21	Horizontal
75°	0.668	22.29	13.48	Vertical	255°	0.687	23.62	13.73	Horizontal
80°	0.670	22.41	13.51	Vertical	260°	0.655	21.42	13.31	Horizontal
85°	0.673	22.63	13.55	Vertical	265°	0.630	19.85	12.98	Horizontal
90°	0.677	22.92	13.60	Vertical	270°	0.616	18.95	12.78	Horizontal
95°	0.683	23.30	13.67	Vertical	275°	0.608	18.48	12.67	Vertical
100°	0.688	23.68	13.74	Vertical	280°	0.607	18.43	12.65	Vertical
105°	0.693	23.98	13.80	Vertical	285°	0.613	18.78	12.74	Vertical
110°	0.696	24.20	13.84	Vertical	290°	0.625	19.51	12.90	Vertical
115°	0.698	24.33	13.86	Vertical	295°	0.642	20.62	13.14	Vertical
120°	0.698	24.38	13.87	Vertical	300°	0.661	21.83	13.39	Vertical
125°	0.701	24.56	13.90	Vertical	305°	0.683	23.30	13.67	Vertical
130°	0.708	25.03	13.99	Vertical	310°	0.709	25.13	14.00	Vertical
135°	0.718	25.81	14.12	Vertical	315°	0.740	27.35	14.37	Vertical
140°	0.734	26.91	14.30	Vertical	320°	0.775	30.05	14.78	Vertical
145°	0.753	28.34	14.52	Vertical	325°	0.815	33.20	15.21	Horizontal
150°	0.776	30.14	14.79	Vertical	330°	0.857	36.71	15.65	Horizontal
155°	0.804	32.33	15.10	Vertical	335°	0.893	39.91	16.01	Horizontal
160°	0.836	34.95	15.43	Vertical	340°	0.926	42.90	16.32	Horizontal
165°	0.868	37.67	15.76	Vertical	345°	0.960	46.07	16.63	Horizontal
170°	0.896	40.12	16.03	Vertical	350°	0.984	48.42	16.85	Horizontal
175°	0.919	42.25	16.26	Vertical	355°	0.997	49.74	16.97	Horizontal

Polarization:
Maximum Field:
Minimum Field:
RMS:
Maximum ERP:
Maximum Power Gain:

Envelope
1.000 @ 358° True
0.606 @ 278° True
0.818
50.000 kW
2.400 (3.802 dB)

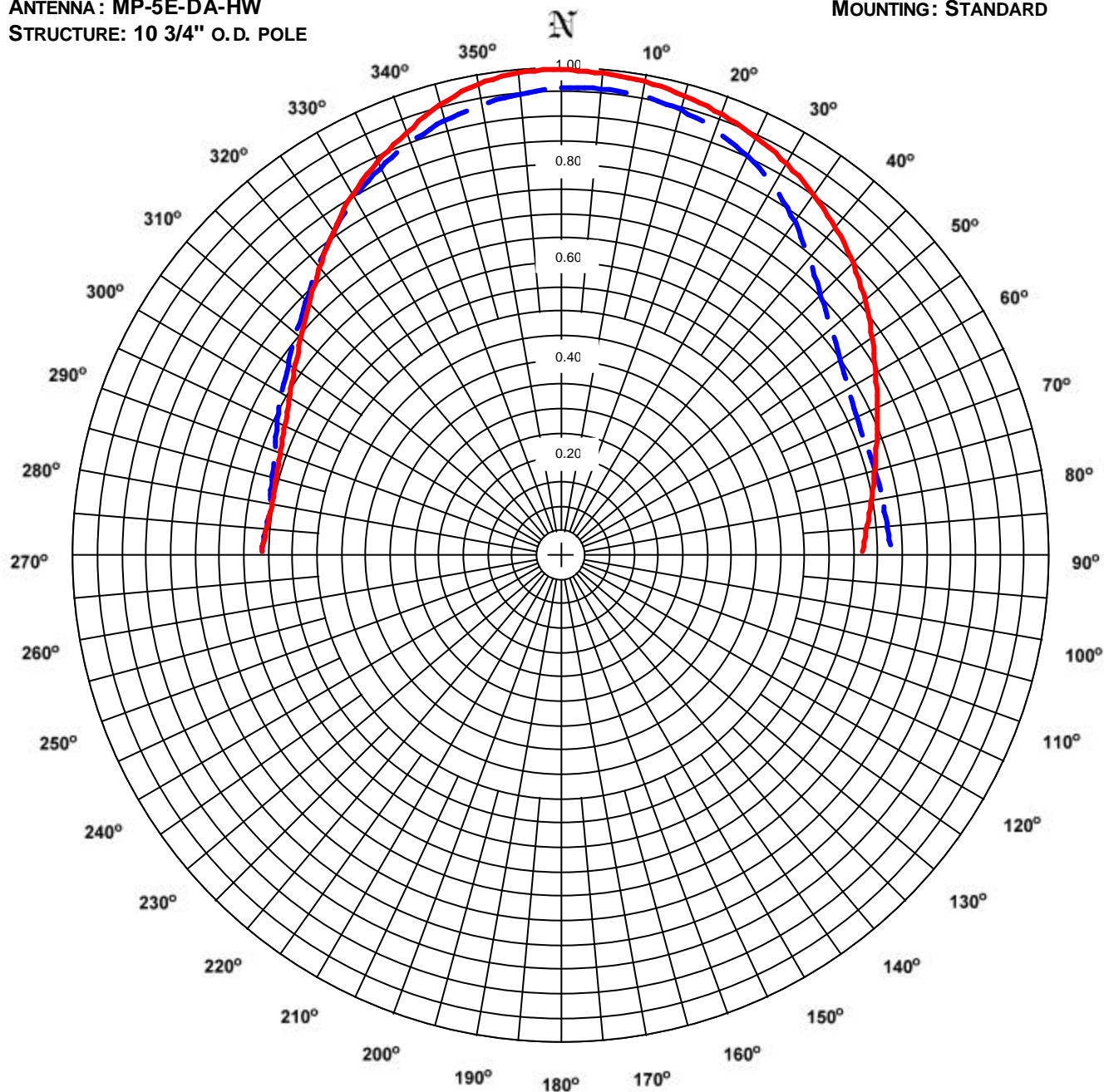
Total Input Power: 20.836 kW

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: 2
STATION: WAYV
LOCATION: ATLANTIC CITY, N.J.
ANTENNA : MP-5E-DA-HW
STRUCTURE: 10 3/4" O.D. POLE

DATE: 10/15/01
FREQUENCY: 95.1 MHz
ORIENTATION: 286° TRUE
MOUNTING: STANDARD



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: WAYV

Location: Atlantic City, N.J.

Frequency: 95.1 MHz

Antenna: MP-5E-DA-HW

Orientation: 286° True

Tower: 10 3/4" o.d. pole

Figure: 2

Date: 10/15/01

Reference: wayv1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	1.000	49.96	16.99	0.961	46.20	16.65	180°	0.901	40.56	16.08	0.939	44.04	16.44
5°	0.996	49.63	16.96	0.964	46.46	16.67	185°	0.922	42.53	16.29	0.954	45.48	16.58
10°	0.990	48.96	16.90	0.960	46.07	16.63	190°	0.941	44.23	16.46	0.965	46.52	16.68
15°	0.980	47.97	16.81	0.949	45.03	16.53	195°	0.956	45.66	16.59	0.971	47.17	16.74
20°	0.966	46.67	16.69	0.931	43.36	16.37	200°	0.967	46.79	16.70	0.974	47.42	16.76
25°	0.949	45.07	16.54	0.907	41.10	16.14	205°	0.976	47.61	16.78	0.970	47.08	16.73
30°	0.929	43.18	16.35	0.875	38.31	15.83	210°	0.981	48.12	16.82	0.961	46.20	16.65
35°	0.906	41.03	16.13	0.837	35.04	15.45	215°	0.983	48.31	16.84	0.946	44.78	16.51
40°	0.879	38.64	15.87	0.794	31.50	14.98	220°	0.974	47.39	16.76	0.926	42.85	16.32
45°	0.849	36.04	15.57	0.756	28.54	14.56	225°	0.948	44.96	16.53	0.899	40.45	16.07
50°	0.815	33.25	15.22	0.724	26.22	14.19	230°	0.907	41.10	16.14	0.867	37.61	15.75
55°	0.780	30.38	14.83	0.700	24.47	13.89	235°	0.864	37.31	15.72	0.830	34.41	15.37
60°	0.746	27.83	14.44	0.682	23.25	13.66	240°	0.821	33.71	15.28	0.786	30.91	14.90
65°	0.716	25.63	14.09	0.671	22.51	13.52	245°	0.772	29.80	14.74	0.745	27.75	14.43
70°	0.689	23.74	13.76	0.667	22.24	13.47	250°	0.726	26.38	14.21	0.710	25.17	14.01
75°	0.666	22.16	13.46	0.668	22.29	13.48	255°	0.687	23.62	13.73	0.677	22.88	13.60
80°	0.646	20.84	13.19	0.670	22.41	13.51	260°	0.655	21.42	13.31	0.650	21.11	13.25
85°	0.629	19.77	12.96	0.673	22.63	13.55	265°	0.630	19.85	12.98	0.629	19.81	12.97
90°	0.615	18.94	12.77	0.677	22.92	13.60	270°	0.616	18.95	12.78	0.616	18.94	12.77
95°	0.605	18.33	12.63	0.683	23.30	13.67	275°	0.607	18.41	12.65	0.608	18.48	12.67
100°	0.599	17.93	12.53	0.688	23.68	13.74	280°	0.603	18.17	12.59	0.607	18.43	12.65
105°	0.595	17.73	12.49	0.693	23.98	13.80	285°	0.605	18.29	12.62	0.613	18.78	12.74
110°	0.596	17.75	12.49	0.696	24.20	13.84	290°	0.612	18.74	12.73	0.625	19.51	12.90
115°	0.600	17.98	12.55	0.698	24.33	13.86	295°	0.625	19.54	12.91	0.642	20.62	13.14
120°	0.607	18.42	12.65	0.698	24.38	13.87	300°	0.643	20.70	13.16	0.661	21.83	13.39
125°	0.617	19.06	12.80	0.701	24.56	13.90	305°	0.667	22.25	13.47	0.683	23.30	13.67
130°	0.631	19.91	12.99	0.708	25.03	13.99	310°	0.696	24.23	13.84	0.709	25.13	14.00
135°	0.648	21.00	13.22	0.718	25.81	14.12	315°	0.730	26.68	14.26	0.740	27.35	14.37
140°	0.668	22.33	13.49	0.734	26.91	14.30	320°	0.770	29.67	14.72	0.775	30.05	14.78
145°	0.692	23.93	13.79	0.753	28.34	14.52	325°	0.815	33.20	15.21	0.814	33.12	15.20
150°	0.719	25.82	14.12	0.776	30.14	14.79	330°	0.857	36.71	15.65	0.849	36.01	15.56
155°	0.749	28.02	14.48	0.804	32.33	15.10	335°	0.893	39.91	16.01	0.879	38.62	15.87
160°	0.782	30.57	14.85	0.836	34.95	15.43	340°	0.926	42.90	16.32	0.904	40.90	16.12
165°	0.816	33.33	15.23	0.868	37.67	15.76	345°	0.960	46.07	16.63	0.926	42.83	16.32
170°	0.848	35.94	15.56	0.896	40.12	16.03	350°	0.984	48.42	16.85	0.942	44.37	16.47
175°	0.876	38.36	15.84	0.919	42.25	16.26	355°	0.997	49.74	16.97	0.954	45.50	16.58

Polarization:

Maximum Field:

Minimum Field:

RMS:

Maximum ERP:

Maximum Power Gain:

Horizontal

1.000 @ 358° True

0.595 @ 107° True

0.799

50.000 kW

2.400 (3.802 dB)

Vertical

0.974 @ 200° True

0.606 @ 278° True

0.799

47.418 kW

2.276 (3.571 dB)

Total Input Power: 20.836 kW



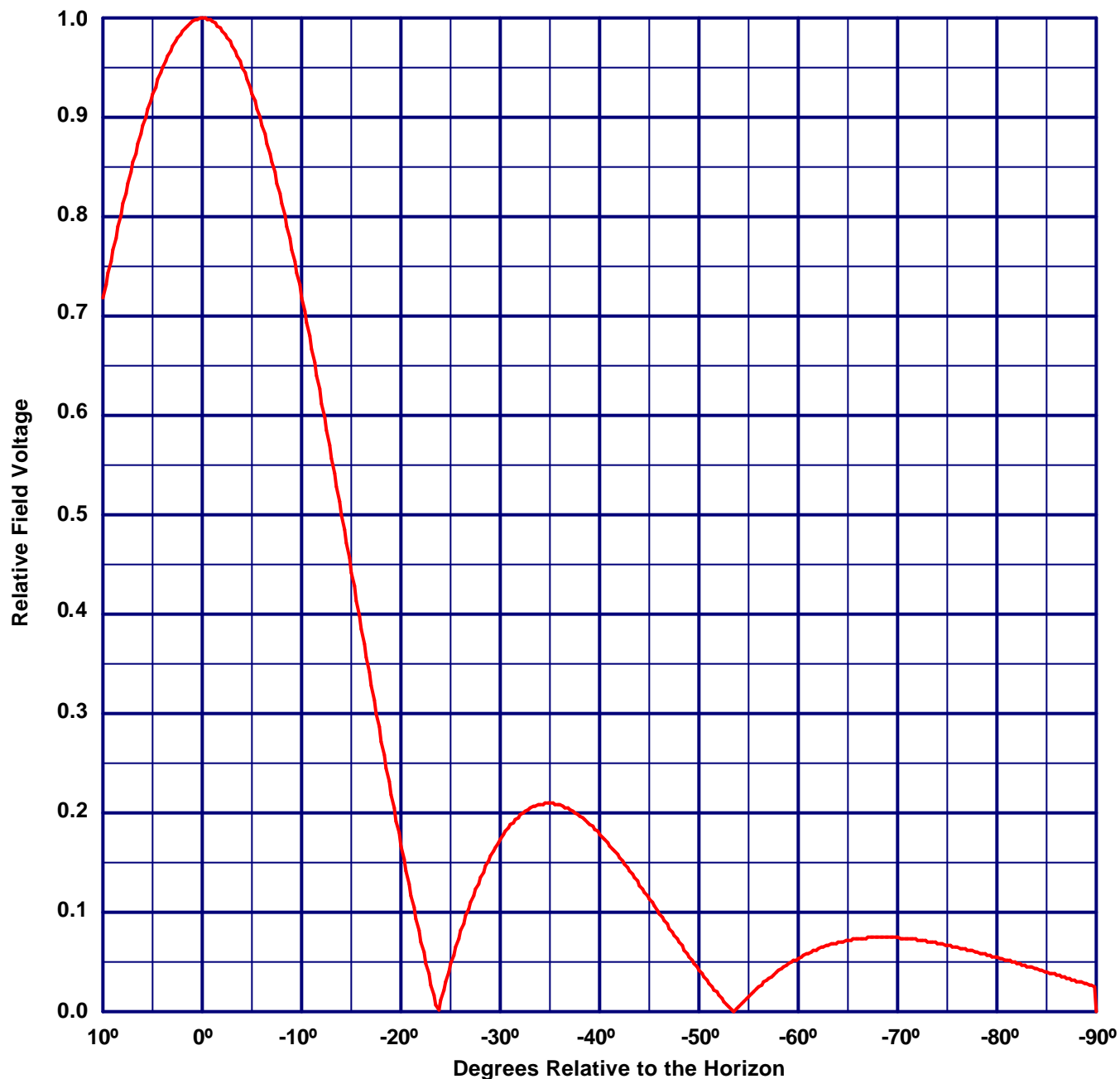
Vertical Plane Relative Field Pattern

WAYV, Atlantic City, N.J., 95.1 MHz

Figure#: 3

Date: 10/15/01

A 5 level, .5 wave-length spaced MP-5E-DA-HW directional antenna with 0° beam tilt, 0% null fill and a H/V maximum power ratio of 1.054



Vertical Polarization Gain:

Maximum: 2.276 (3.571 dB)

Horizontal Plane: 2.276 (3.571 dB)

Horizontal Polarization Gain:

Maximum: 2.400 (3.802 dB)

Horizontal Plane: 2.400 (3.802 dB)

Directional Antenna System
for
WAYV, Atlantic City New Jersey

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	MP-5E-DA-HW
Frequency:	95.1 MHz
Number of Bays:	5

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	29 ft 4 in
Aperture length required:	36 ft.
Orientation:	286° true
Input flange to the antenna 3 1/8 inch female	

ELECTRICAL SPECIFICATIONS

(For directional use)

Maximum horizontal ERP:	50 kW (16.99 dBk)
Horizontal maximum power gain:	2.400 (3.802 dB)
Maximum vertical ERP:	47.438 kW (16.761 dBk)
Vertical maximum power gain:	2.276 (3.571 dB)
Total input power:	20.836 kW (13.188 dBk)

Directional Antenna System
For
WAYV, Atlantic City New Jersey

(Continued)

