



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
WBHY-FM
Goforth Media, Inc.
Mobile, AL**

A standard model PSIFHR antenna with parasitic elements and custom brackets was used in conjunction with a model of the customer's 90" face tower to create the necessary directional radiation pattern. The final antenna consists of eight radiating elements full wavelength spaced with one horizontal and two vertical parasitic elements per bay. The antenna array is center fed. Each radiating element receives equal power and phase.

Pattern testing was performed using a 1/3-scale model element and tower. The azimuth plane measurements were taken on a ground reflection test range. This type of test range utilizes the reflected signal and direct signal from the source antenna to form an interference pattern on the antenna under test. The antenna and tower under test were mounted to a turntable that allowed the structure to be rotated 360° in the azimuth plane. The source antenna was located approximately 75 ft. from the antenna under test. The source height above ground was adjusted to peak the first lobe of the interference pattern at the antenna under test.

The test antenna was mounted in the center of rotation of the turntable. The antenna and mounting structure were rotated clockwise while data was recorded in a counter clockwise direction. All feed cables to the antenna were secured and grounded during pattern measurements. A Hewlett Packard 8753E-network analyzer operating at 265.5 MHz was used as both the source and receiver. The level of the received signal was compared with a standard dipole to establish the directivity of the final pattern. The final pattern measured does not exceed the envelope pattern and is 88.6% of the envelope RMS.

The antenna is to be mounted 239 meters (784.7 ft.) above ground level per the construction permit. A deviation of +2/-4 meters from the approved center of radiation is allowed. No other antenna can be installed within 10 ft of any radiating element. The antenna is to be mounted to the southeast tower face with the custom mounting brackets supplied with the antennas. The antenna is to be positioned 110° True and certified by a licensed surveyor. It is recommended that a broadcast engineer is present to supervise



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the installation of the antenna and that he or she certifies the antenna has been installed according to the enclosed instructions.

An input power level of 16.95 kW will be required at the antenna input in order to reach the licensed 100 kW ERP. The transmitter output power requirements are dependent upon the transmission line size and length used to feed the antenna. The final length of transmission line must be determined after installation.

Antenna Specifications

Antenna Model	PSIFHR-8C-DA
Type	8-bay directional FM antenna
Bay Spacing	Full wavelength spaced elements
Frequency	88.5 MHz
Polarization	Circular
Envelope RMS	.884
Composite RMS	.783
Gain (h-pol)	5.90 (7.71 dB)
Gain (v-pol)	5.27 (7.22 dB)
Input	3-1/8" EIA end fed input
Input power	16.95 kW
Power rating	32 kW
Length	83.66 ft.
Weight	1605 lbs.
Wind Area	128.3 sq. ft.

Statement of Certification

This is to certify the antenna has been designed, fabricated and tested under my supervision and it meets the required envelope pattern limitations set forth in the stations construction permit.

Douglas A. Ross
President
Propagation Systems Inc.

ELEV.
826'-0"

ELEV.
804'-0"

ELEV.
774'-0"

ELEV. 744'-0"

RCAGL
784.7 FT



SPECIFICATIONS

SPACING:	λ
BAY SPACING ('L'):	133.37 IN
APERTURE ('A'):	77.8 FT
OVERALL LENGTH:	83.66 FT
RCAGL:	784.7 FT
WEIGHT:	1605 LB
WIND AREA:	128.3 FT ²
POWER RATING:	39kW
GAIN:	5.9 (7.71 dB)
POLARIZATION	CIRCULAR
NOTE: 1. WEIGHT AND WIND AREA ARE ESTIMATED. WIND AREA IN ACCORDANCE WITH TIA/EIA-222-F $\Sigma(\text{CaAc})$	

REV.	MADE BY	CHECKED BY	DATE	CHANGE

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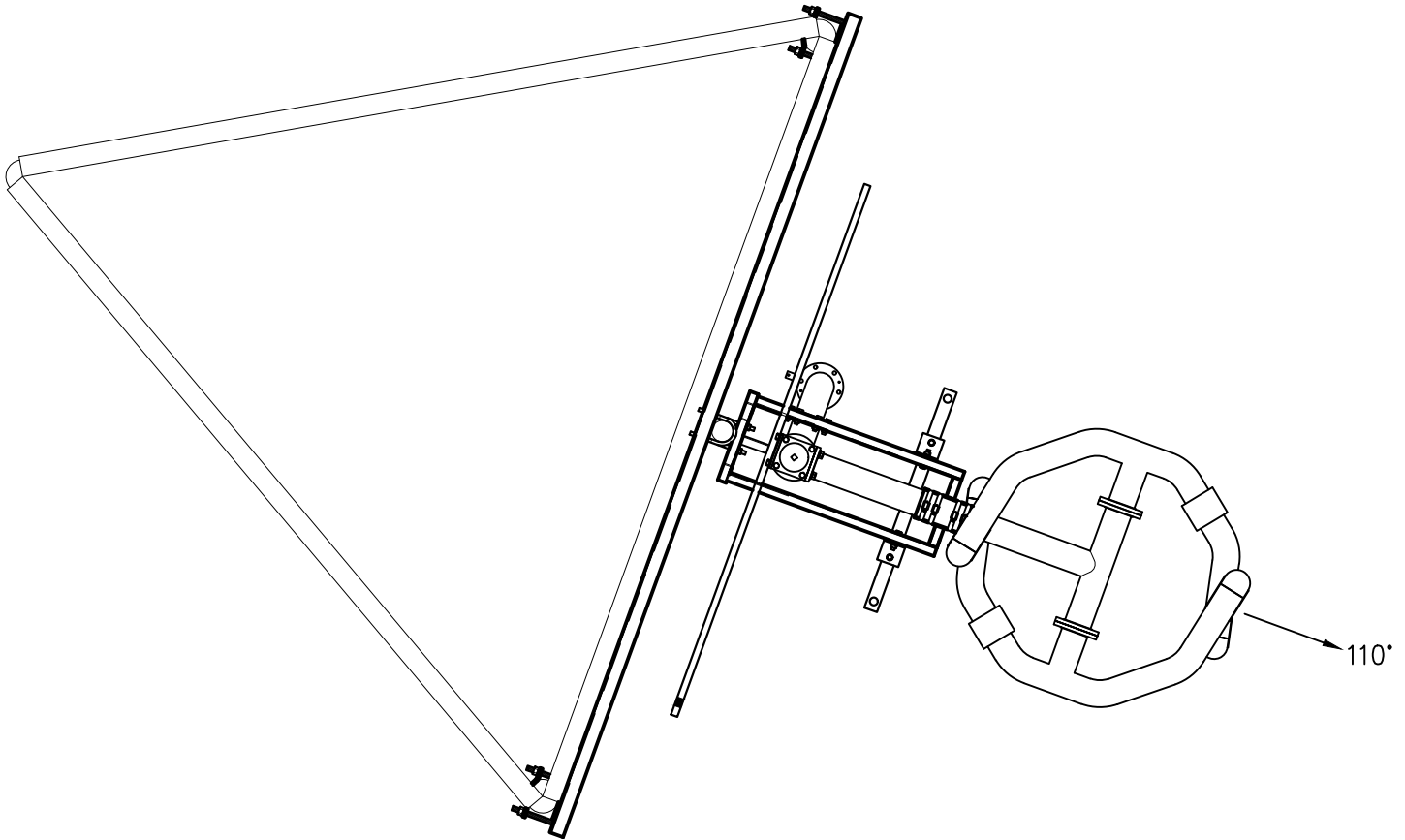
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PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATION & SPECIFICATIONS

MODEL:	PSIFHR-8C-DA	DRAWN BY:	M.MOCK	DATE:	10/27/17
CHANNEL/ FREQUENCY:	88.5 MHz	APPROVED BY:		DATE:	
SCALE:		DRAWING NO.:	1777-001	REV.	



REV.	MADE BY CHECKED BY	DATE	CHANGE

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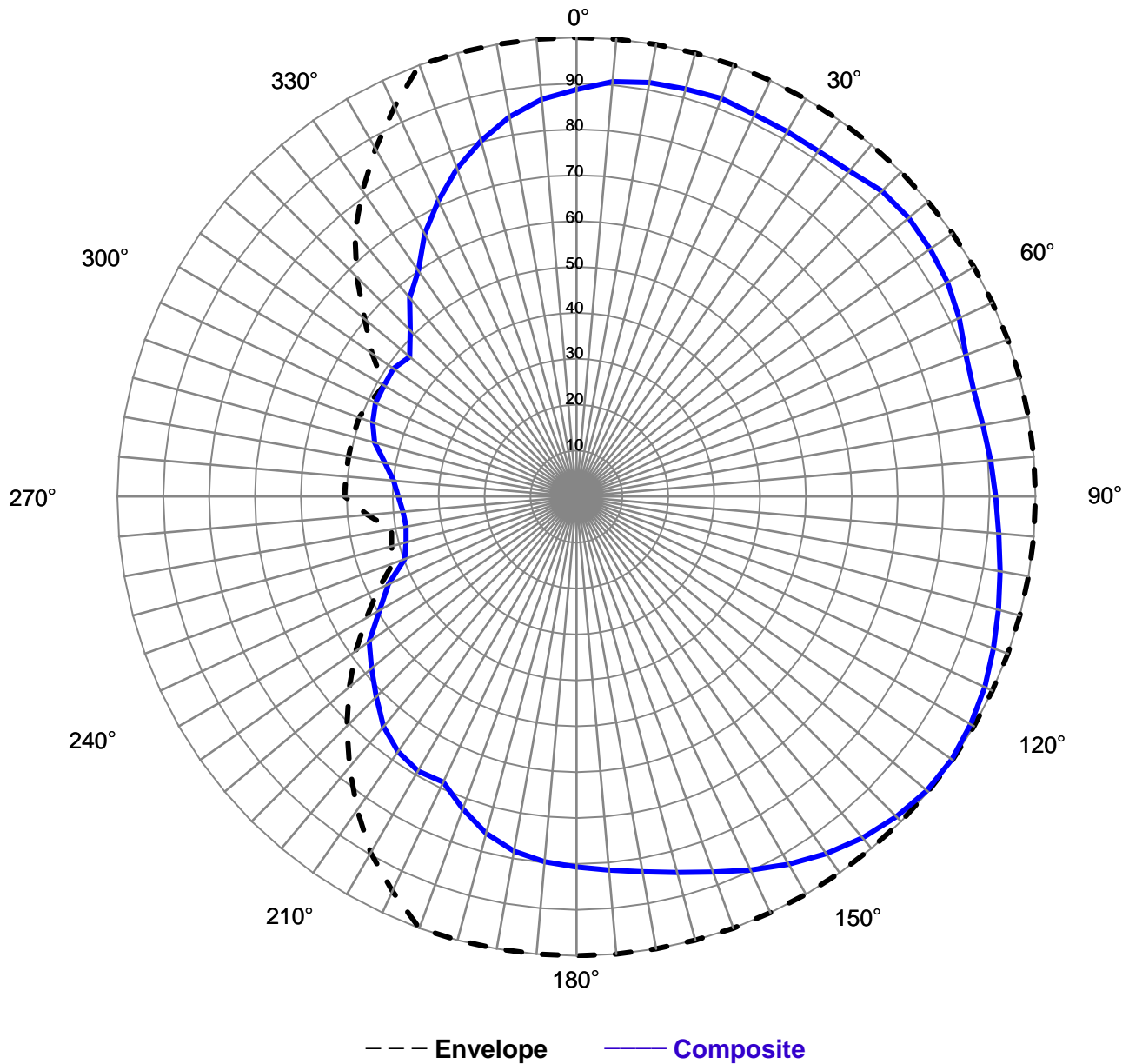
PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ORIENTATION AND PLAN VIEW			
MODEL:	PSIFHR-8C-DA	DRAWN BY:	M.MOCK
CHANNEL/ FREQUENCY:	88.5 MHz	APPROVED BY:	
SCALE:		DRAWING NO.:	1777-002
			REV.



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Composite	Tower:	90" Custom Tower
Antenna Model:	PSIFHR-8C-DA	Orientation:	110°
Polarization:	Circular	Frequency:	88.5 MHz
RMS (envelope)	0.884	Station:	WBHY-FM
RMS (composite)	0.783	Date:	10/24/2017

Maximum Envelope Tabulation

Antenna Model: PSIFHR-8C-DA

Goforth Media, Inc.

Station: WBHY-FM

Frequency: 88.5 MHz

Location: Mobile, AL

Maximum ERP: 100 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	1.000	100.00	20.00
10	1.000	100.00	20.00
20	1.000	100.00	20.00
30	1.000	100.00	20.00
40	1.000	100.00	20.00
50	1.000	100.00	20.00
60	1.000	100.00	20.00
70	1.000	100.00	20.00
80	1.000	100.00	20.00
90	1.000	100.00	20.00
100	1.000	100.00	20.00
110	1.000	100.00	20.00
120	1.000	100.00	20.00
130	1.000	100.00	20.00
140	1.000	100.00	20.00
150	1.000	100.00	20.00
160	1.000	100.00	20.00
170	1.000	100.00	20.00
180	1.000	100.00	20.00
190	1.000	100.00	20.00
200	1.000	100.00	20.00
210	0.896	80.28	19.05
220	0.769	59.14	17.72
230	0.646	41.73	16.20
240	0.528	27.88	14.45
250	0.425	18.06	12.57
260	0.409	16.73	12.23
270	0.505	25.50	14.07
280	0.504	25.40	14.05
290	0.504	25.40	14.05
300	0.484	23.43	13.70
310	0.602	36.24	15.59
320	0.751	56.40	17.51
330	0.875	76.56	18.84
340	1.000	100.00	20.00
350	1.000	100.00	20.00

Composite Pattern Tabulation

Antenna Model: PSIFHR-8C-DA

Goforth Media, Inc.

Station: WBHY-FM

Frequency: 88.5 MHz

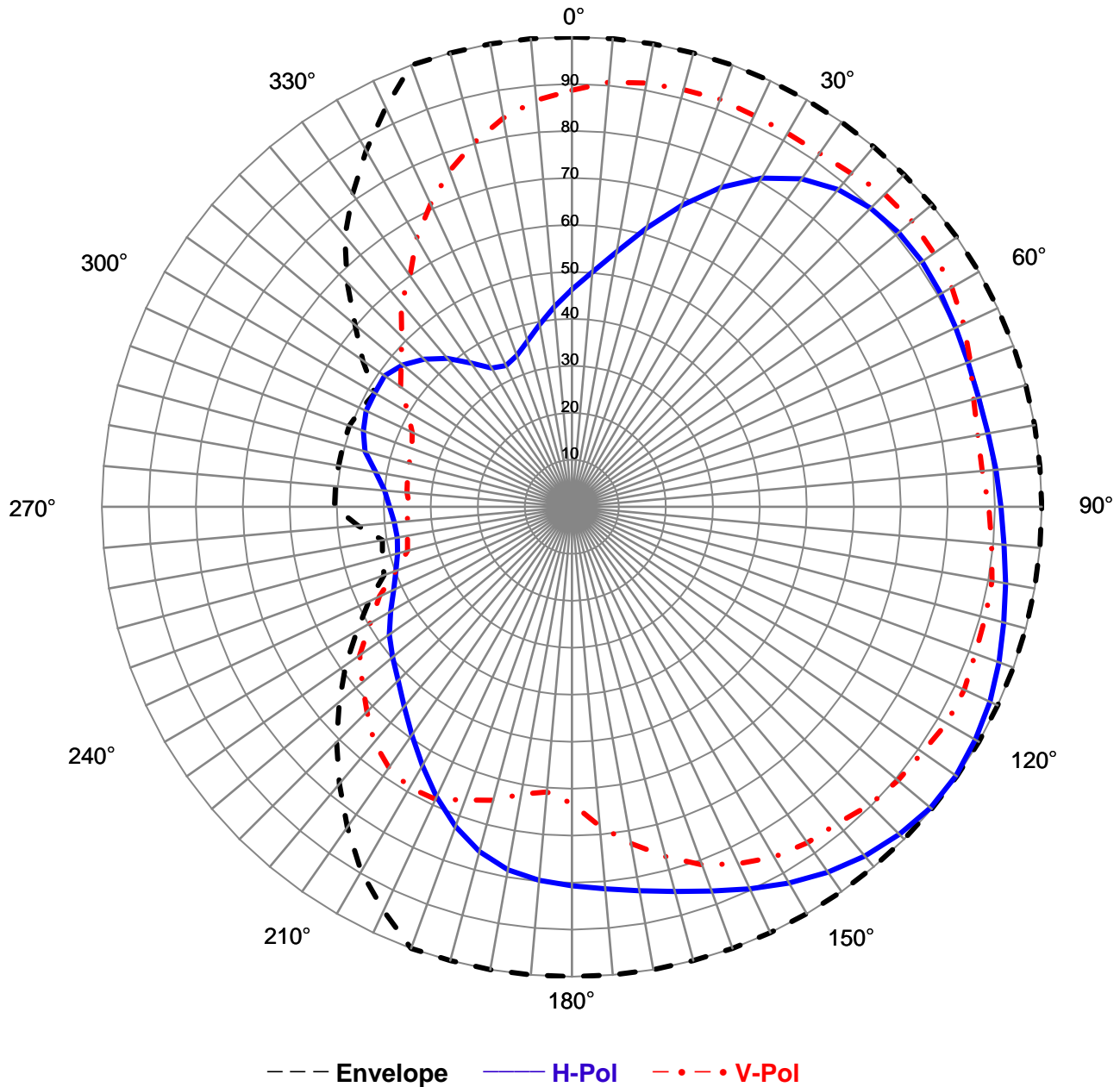
Location: Mobile, AL

Maximum ERP: 100 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.887	78.59	18.95
10	0.916	83.82	19.23
20	0.923	85.13	19.30
30	0.918	84.31	19.26
40	0.925	85.64	19.33
50	0.945	89.30	19.51
60	0.934	87.15	19.40
70	0.903	81.48	19.11
80	0.899	80.89	19.08
90	0.913	83.37	19.21
100	0.937	87.85	19.44
110	0.967	93.53	19.71
120	0.991	98.30	19.93
130	0.996	99.27	19.97
140	0.970	94.13	19.74
150	0.925	85.51	19.32
160	0.870	75.72	18.79
170	0.830	68.86	18.38
180	0.807	65.08	18.13
190	0.784	61.51	17.89
200	0.724	52.39	17.19
210	0.690	47.62	16.78
220	0.654	42.77	16.31
230	0.582	33.90	15.30
240	0.495	24.50	13.89
250	0.398	15.86	12.00
260	0.377	14.20	11.52
270	0.388	15.05	11.77
280	0.424	17.94	12.54
290	0.472	22.28	13.48
300	0.484	23.43	13.70
310	0.474	22.47	13.52
320	0.565	31.92	15.04
330	0.660	43.62	16.40
340	0.760	57.82	17.62
350	0.840	70.53	18.48



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Field	Tower:	90" Custom Tower
Antenna Model:	PSIFHR-8C-DA	Orientation:	110°
Polarization:	Circular	Frequency:	88.5 MHz
Gain (H-pol):	5.90 (7.71 dB)	Station:	WBHY-FM
Gain (V-pol):	5.27 (7.22 dB)	Date:	10/24/2017

Measured Relative Field Tabulation

Antenna Model: PSIFHR-8C-DA

Goforth Media, Inc.

Station: WBHY-FM

Frequency: 88.5 MHz

Location: Mobile, AL

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.463	1.262	1.01
10	0.551	1.794	2.54
20	0.682	2.747	4.39
30	0.808	3.849	5.85
40	0.881	4.584	6.61
50	0.908	4.861	6.87
60	0.907	4.850	6.86
70	0.897	4.750	6.77
80	0.899	4.773	6.79
90	0.913	4.919	6.92
100	0.937	5.183	7.15
110	0.967	5.518	7.42
120	0.991	5.800	7.63
130	0.996	5.857	7.68
140	0.970	5.554	7.45
150	0.925	5.045	7.03
160	0.870	4.467	6.50
170	0.830	4.062	6.09
180	0.807	3.840	5.84
190	0.784	3.629	5.60
200	0.724	3.091	4.90
210	0.636	2.385	3.78
220	0.555	1.814	2.59
230	0.498	1.460	1.64
240	0.445	1.168	0.68
250	0.398	0.936	-0.29
260	0.377	0.838	-0.77
270	0.388	0.888	-0.52
280	0.424	1.058	0.25
290	0.472	1.314	1.19
300	0.484	1.382	1.41
310	0.470	1.302	1.15
320	0.412	1.002	0.01
330	0.341	0.687	-1.63
340	0.342	0.691	-1.61
350	0.394	0.917	-0.38

Maximum Value

Field 1.000
Gain 5.90 (7.71 dB)
Azimuth Bearing 128 degrees

Minimum Field

Field 0.332
Gain .650 (-1.87 dB)
Azimuth Bearing 335 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.887	4.637	6.66
10	0.916	4.946	6.94
20	0.923	5.022	7.01
30	0.918	4.974	6.97
40	0.925	5.053	7.04
50	0.945	5.269	7.22
60	0.934	5.142	7.11
70	0.903	4.807	6.82
80	0.877	4.541	6.57
90	0.887	4.644	6.67
100	0.908	4.863	6.87
110	0.914	4.924	6.92
120	0.921	5.005	6.99
130	0.906	4.842	6.85
140	0.879	4.563	6.59
150	0.861	4.369	6.40
160	0.811	3.879	5.89
170	0.728	3.124	4.95
180	0.631	2.352	3.71
190	0.621	2.277	3.57
200	0.664	2.601	4.15
210	0.690	2.809	4.49
220	0.654	2.524	4.02
230	0.582	2.000	3.01
240	0.495	1.446	1.60
250	0.398	0.935	-0.29
260	0.355	0.744	-1.29
270	0.345	0.702	-1.54
280	0.355	0.744	-1.29
290	0.362	0.773	-1.12
300	0.403	0.958	-0.19
310	0.474	1.326	1.22
320	0.565	1.883	2.75
330	0.660	2.573	4.11
340	0.760	3.411	5.33
350	0.840	4.161	6.19

Maximum Value

Field 0.945
Gain 5.27 (7.22 dB)
Azimuth Bearing 50 degrees

Minimum Field

Field 0.345
Gain .702 (-1.54 dB)
Azimuth Bearing 270 degrees

ERP Tabulation

Antenna Model: PSIFHR-8C-DA

Goforth Media, Inc.

Station: WBHY-FM

Frequency: 88.5 MHz

Location: Mobile, AL

Maximum ERP: 100 kW

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.463	21.40	13.30
10	0.551	30.41	14.83
20	0.682	46.57	16.68
30	0.808	65.24	18.15
40	0.881	77.70	18.90
50	0.908	82.39	19.16
60	0.907	82.20	19.15
70	0.897	80.50	19.06
80	0.899	80.89	19.08
90	0.913	83.37	19.21
100	0.937	87.85	19.44
110	0.967	93.53	19.71
120	0.991	98.30	19.93
130	0.996	99.27	19.97
140	0.970	94.13	19.74
150	0.925	85.51	19.32
160	0.870	75.72	18.79
170	0.830	68.86	18.38
180	0.807	65.08	18.13
190	0.784	61.51	17.89
200	0.724	52.39	17.19
210	0.636	40.43	16.07
220	0.555	30.75	14.88
230	0.498	24.75	13.94
240	0.445	19.80	12.97
250	0.398	15.86	12.00
260	0.377	14.20	11.52
270	0.388	15.05	11.77
280	0.424	17.94	12.54
290	0.472	22.28	13.48
300	0.484	23.43	13.70
310	0.470	22.07	13.44
320	0.412	16.99	12.30
330	0.341	11.64	10.66
340	0.342	11.71	10.69
350	0.394	15.54	11.91

Maximum Value (H-pol)

Field 1.000
ERP 100 kW (20 dBk)
Azimuth Bearing 128 degrees

Minimum Field (H-pol)

Field 0.332
ERP 11.02 kW (10.42 dBk)
Azimuth Bearing 335 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.887	78.59	18.95
10	0.916	83.82	19.23
20	0.923	85.13	19.30
30	0.918	84.31	19.26
40	0.925	85.64	19.33
50	0.945	89.30	19.51
60	0.934	87.15	19.40
70	0.903	81.48	19.11
80	0.877	76.96	18.86
90	0.887	78.72	18.96
100	0.908	82.43	19.16
110	0.914	83.46	19.21
120	0.921	84.83	19.29
130	0.906	82.07	19.14
140	0.879	77.33	18.88
150	0.861	74.06	18.70
160	0.811	65.75	18.18
170	0.728	52.95	17.24
180	0.631	39.86	16.01
190	0.621	38.59	15.86
200	0.664	44.08	16.44
210	0.690	47.62	16.78
220	0.654	42.77	16.31
230	0.582	33.90	15.30
240	0.495	24.50	13.89
250	0.398	15.84	12.00
260	0.355	12.60	11.00
270	0.345	11.90	10.76
280	0.355	12.60	11.00
290	0.362	13.10	11.17
300	0.403	16.24	12.11
310	0.474	22.47	13.52
320	0.565	31.92	15.04
330	0.660	43.62	16.40
340	0.760	57.82	17.62
350	0.840	70.53	18.48

Maximum Value (V-pol)

Field 0.945
ERP 89.3 kW (19.51 dBk)
Azimuth Bearing 50 degrees

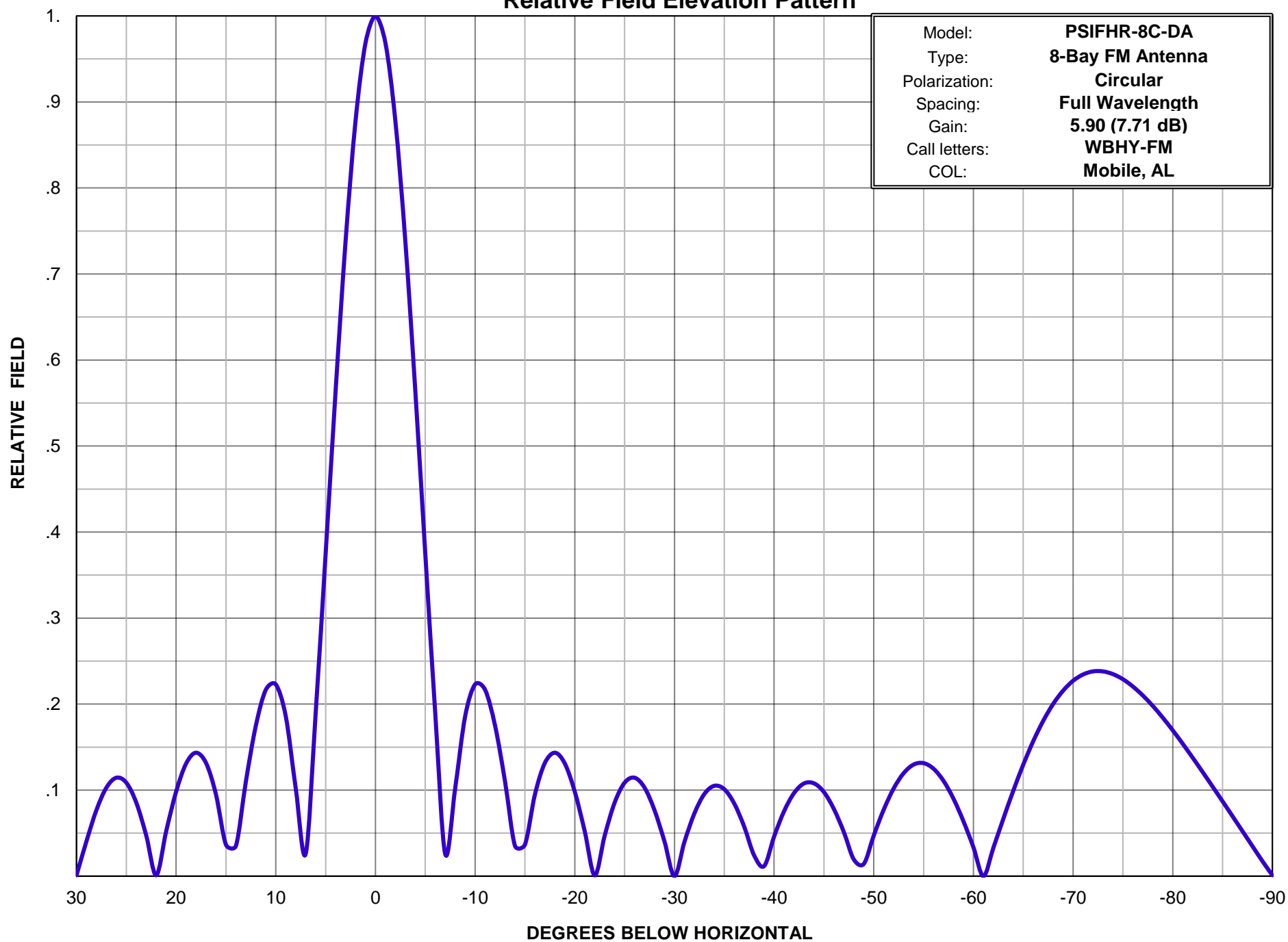
Minimum Field (V-pol)

Field 0.345
ERP 11.90 kW (10.76 dBk)
Azimuth Bearing 270 degrees



Propagation Systems, Inc.

Relative Field Elevation Pattern





Propagation Systems Inc.

Relative Field Tabulation Elevation Pattern

Antenna Model: PSIFHR-8C-DA

Gain: 5.90 (7.71 dBd)

Station: WBHY-FM

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90.0	0.001	-60.000	-50.0	0.047	-26.508	-10.0	0.223	-13.033
-89.0	0.017	-35.177	-49.0	0.014	-36.928	-9.0	0.186	-14.614
-88.0	0.035	-29.156	-48.0	0.019	-34.247	-8.0	0.102	-19.818
-87.0	0.052	-25.634	-47.0	0.051	-25.813	-7.0	0.026	-31.782
-86.0	0.070	-23.136	-46.0	0.078	-22.155	-6.0	0.189	-14.460
-85.0	0.087	-21.213	-45.0	0.098	-20.200	-5.0	0.375	-8.530
-84.0	0.104	-19.652	-44.0	0.108	-19.341	-4.0	0.564	-4.978
-83.0	0.121	-18.340	-43.0	0.108	-19.353	-3.0	0.738	-2.644
-82.0	0.138	-17.220	-42.0	0.097	-20.308	-2.0	0.878	-1.134
-81.0	0.154	-16.253	-41.0	0.075	-22.446	-1.0	0.968	-0.278
-80.0	0.170	-15.414	-40.0	0.046	-26.733	0.0	1.000	0.000
-79.0	0.184	-14.692	-39.0	0.012	-38.661	1.0	0.968	-0.278
-78.0	0.198	-14.072	-38.0	0.024	-32.363	2.0	0.878	-1.131
-77.0	0.210	-13.556	-37.0	0.058	-24.795	3.0	0.738	-2.640
-76.0	0.220	-13.134	-36.0	0.084	-21.474	4.0	0.564	-4.973
-75.0	0.229	-12.806	-35.0	0.101	-19.908	5.0	0.375	-8.523
-74.0	0.235	-12.584	-34.0	0.105	-19.576	6.0	0.190	-14.446
-73.0	0.238	-12.467	-33.0	0.095	-20.404	7.0	0.026	-31.680
-72.0	0.238	-12.467	-32.0	0.073	-22.748	8.0	0.102	-19.831
-71.0	0.234	-12.601	-31.0	0.040	-28.025	9.0	0.186	-14.621
-70.0	0.227	-12.875	-30.0	0.001	-60.000	10.0	0.223	-13.039
-69.0	0.216	-13.327	-29.0	0.040	-27.861	11.0	0.217	-13.284
-68.0	0.200	-13.973	-28.0	0.077	-22.308	12.0	0.175	-15.132
-67.0	0.180	-14.873	-27.0	0.103	-19.753	13.0	0.110	-19.148
-66.0	0.157	-16.092	-26.0	0.114	-18.832	14.0	0.035	-29.044
-65.0	0.130	-17.752	-25.0	0.109	-19.280	15.0	0.037	-28.751
-64.0	0.099	-20.066	-24.0	0.085	-21.365	16.0	0.095	-20.473
-63.0	0.067	-23.522	-23.0	0.047	-26.536	17.0	0.132	-17.620
-62.0	0.033	-29.662	-22.0	0.001	-60.828	18.0	0.143	-16.864
-61.0	0.001	-60.000	-21.0	0.052	-25.660	19.0	0.131	-17.661
-60.0	0.034	-29.464	-20.0	0.098	-20.159	20.0	0.098	-20.146
-59.0	0.064	-23.905	-19.0	0.131	-17.661	21.0	0.052	-25.634
-58.0	0.090	-20.915	-18.0	0.143	-16.864	22.0	0.001	-59.489
-57.0	0.111	-19.113	-17.0	0.132	-17.610	23.0	0.047	-26.536
-56.0	0.125	-18.072	-16.0	0.095	-20.459	24.0	0.085	-21.365
-55.0	0.131	-17.630	-15.0	0.037	-28.715	25.0	0.109	-19.280
-54.0	0.130	-17.741	-14.0	0.035	-29.081	26.0	0.114	-18.832
-53.0	0.120	-18.438	-13.0	0.110	-19.160	27.0	0.103	-19.753
-52.0	0.102	-19.831	-12.0	0.175	-15.139	28.0	0.077	-22.291
-51.0	0.077	-22.239	-11.0	0.217	-13.284	29.0	0.041	-27.828