



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
WRHP
Anniston Seventh-Day Adventist Church
Anniston, AL**

A standard model PSIFM antenna with parasitic elements was used in conjunction with the customer's Pyrod self-supporting triangular tower to create the necessary directional radiation pattern. The final antenna consists of three radiating elements each secured to the tower with a custom mounting bracket. The antenna bays are full-wave spaced and there are a total of two vertical parasitic elements per bay. The antenna array is end fed from an existing flexible transmission line. Each radiating element receives equal power and the correct 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 was 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 300.3 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 88.5% of the envelope RMS.

The antenna is to be mounted 20 meters (65.6 ft.) +2/-4 meters above ground level on a the north tower leg and positioned 0° True. No other antenna can be installed within 10 ft. of any radiating element. It is recommended that a broadcast engineer be present to supervise the installation of the antenna and that he or she certifies that the antenna has been installed according to the enclosed instructions.



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The measured principal minima at 180 and 190 degrees are 2.5 kW and 3.04 kW respectively, below the approved levels of 3.2 kW. An input power level of 2.73 kW will be required at the antenna input in order to reach the approved 5.4 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.

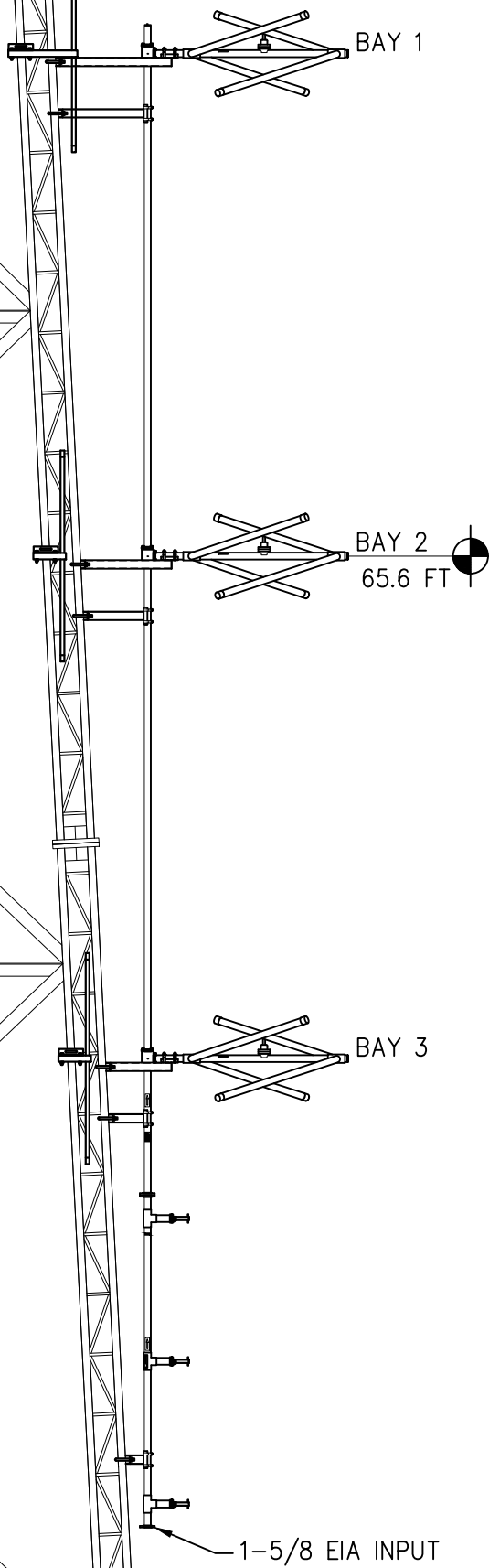
Antenna Specifications

Antenna Model	PSIFM-3E-DA
Type	3-bay directional FM antenna
Bay Spacing	Full-wave spaced elements
Frequency	100.1 MHz
Polarization	Circular
Envelope RMS	.983
Composite RMS	.870
Gain (h-pol)	1.98 (2.97 dB)
Gain (v-pol)	1.98 (2.97 dB)
ERP	5.4 kW
Antenna input power	2.73 kW
Input	1-5/8" EIA end fed input
Power rating	9 kW
Length	29.38 ft.
Weight	176 lbs.
Wind Area	17.1 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.



SPECIFICATIONS	
SPACING:	λ
BAY SPACING ('L'):	117.91 IN
APERTURE ('A'):	19.65 FT
OVERALL LENGTH:	29.38 FT
RCAGL:	65.6 FT
WEIGHT:	176 LB
WIND AREA:	17.1 FT ²
POWER RATING:	9 kW
GAIN:	1.98 (2.97 dB)
POLARIZATION:	CIRCULAR
NOTE: 1. WEIGHT AND WIND AREA ARE ESTIMATED. WIND AREA IN ACCORDANCE WITH TIA/EIA-222-F $\Sigma(CaAc)$	
2. TIE WRAP COAX. CABLE AT $\pm 16"$ O.C.	

REV.	MADE BY	CHECKED BY	DATE	CHANGE

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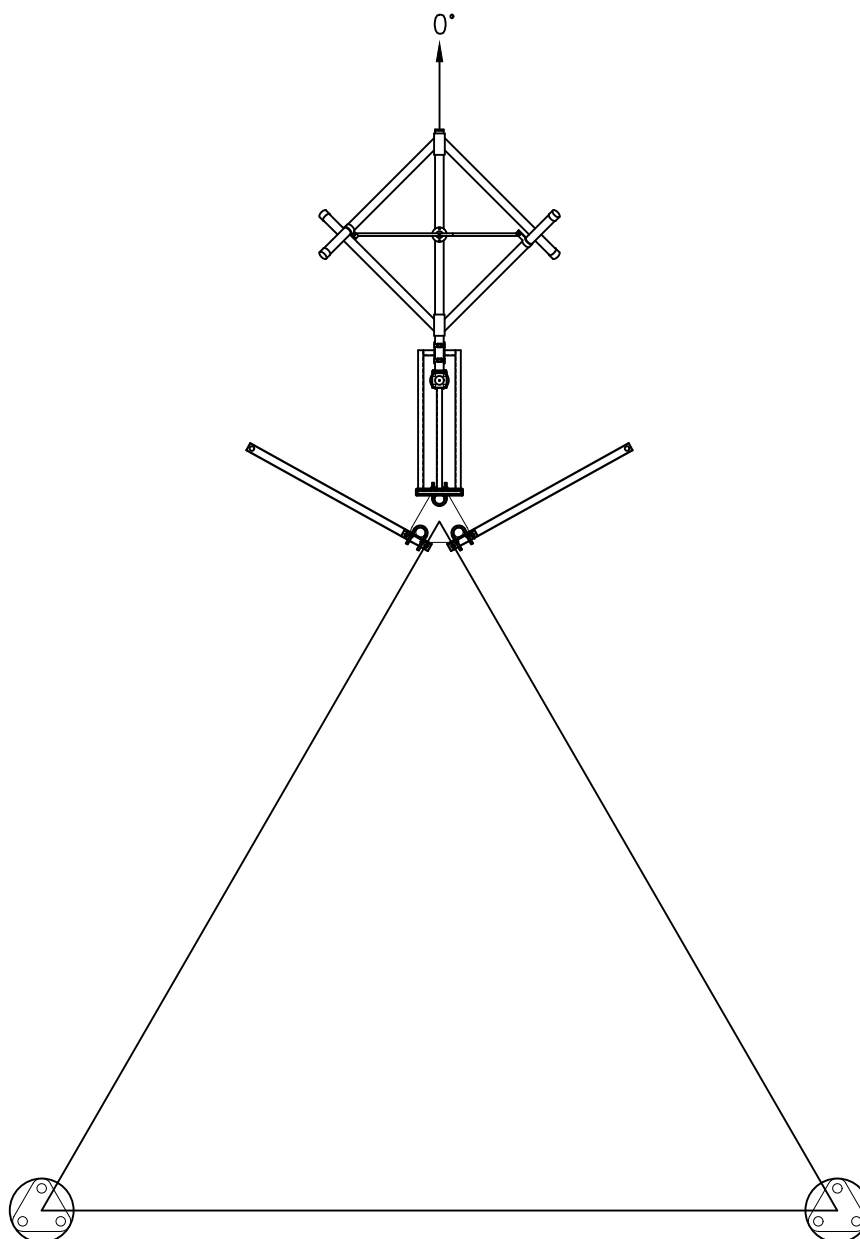
SIZE

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PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATION AND SPECIFICATIONS			
MODEL:	PSIFM-3E-DA	DRAWN BY:	M.MOCK
CHANNEL/FREQUENCY:	100.1 MHz	APPROVED BY:	
SCALE:		DRAWING NO.:	1785-001
			REV.



PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA PLAN VIEW AND ORIENTATION

REV.	MADE BY	CHECKED BY	DATE	CHANGE

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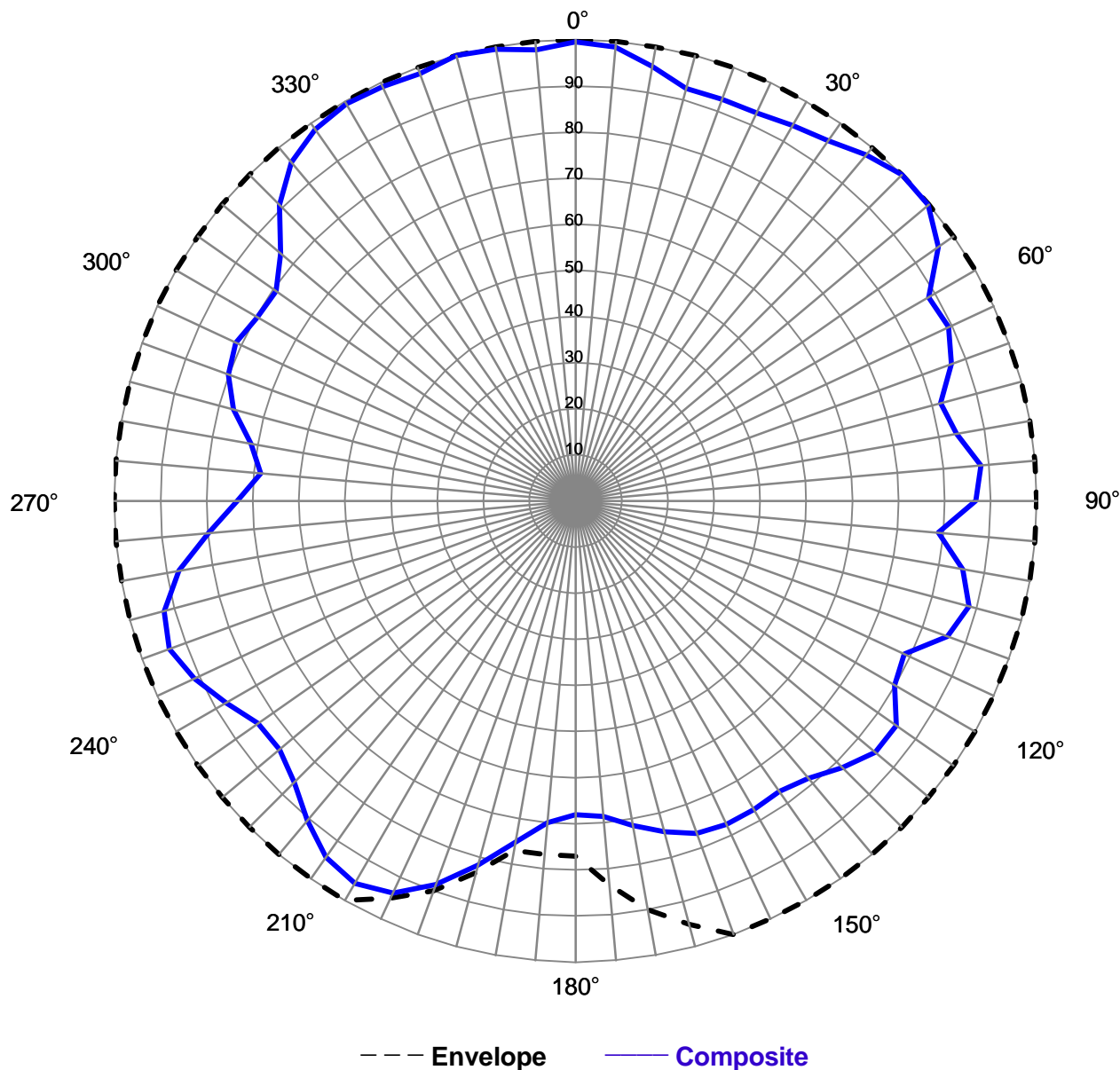
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MODEL:	PSIFM-3E-DA	DRAWN BY:	M.MOCK	DATE:	10/30/17
CHANNEL/ FREQUENCY:	100.1 MHz	APPROVED BY:		DATE:	
SCALE:		DRAWING NO.:	1785-002	REV.	



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Composite	Tower:	Pirot
Antenna Model:	PSIFM-3E-DA	Orientation:	0°
Polarization:	Circular	Frequency:	100.1 MHz
RMS (envelope)	0.983	Station:	WRHP
RMS (composite)	0.870	Date:	11/20/2017

Maximum Envelope Tabulation

Antenna: PSIFM-3E-DA

Anniston Seventh-Day Adventist Church

Station: WRHP

Frequency: 100.1 MHz

Location: Anniston, AL

Maximum ERP: 5.4 kW (7.32 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	1.000	5.40	7.32
10	1.000	5.40	7.32
20	1.000	5.40	7.32
30	1.000	5.40	7.32
40	1.000	5.40	7.32
50	1.000	5.40	7.32
60	1.000	5.40	7.32
70	1.000	5.40	7.32
80	1.000	5.40	7.32
90	1.000	5.40	7.32
100	1.000	5.40	7.32
110	1.000	5.40	7.32
120	1.000	5.40	7.32
130	1.000	5.40	7.32
140	1.000	5.40	7.32
150	1.000	5.40	7.32
160	1.000	5.40	7.32
170	0.900	4.37	6.41
180	0.770	3.20	5.05
190	0.770	3.20	5.05
200	0.900	4.37	6.41
210	1.000	5.40	7.32
220	1.000	5.40	7.32
230	1.000	5.40	7.32
240	1.000	5.40	7.32
250	1.000	5.40	7.32
260	1.000	5.40	7.32
270	1.000	5.40	7.32
280	1.000	5.40	7.32
290	1.000	5.40	7.32
300	1.000	5.40	7.32
310	1.000	5.40	7.32
320	1.000	5.40	7.32
330	1.000	5.40	7.32
340	1.000	5.40	7.32
350	1.000	5.40	7.32

Composite Pattern Tabulation

Antenna: PSIFM-3E-DA

Anniston Seventh-Day Adventist Church

Station: WRHP

Frequency: 100.1 MHz

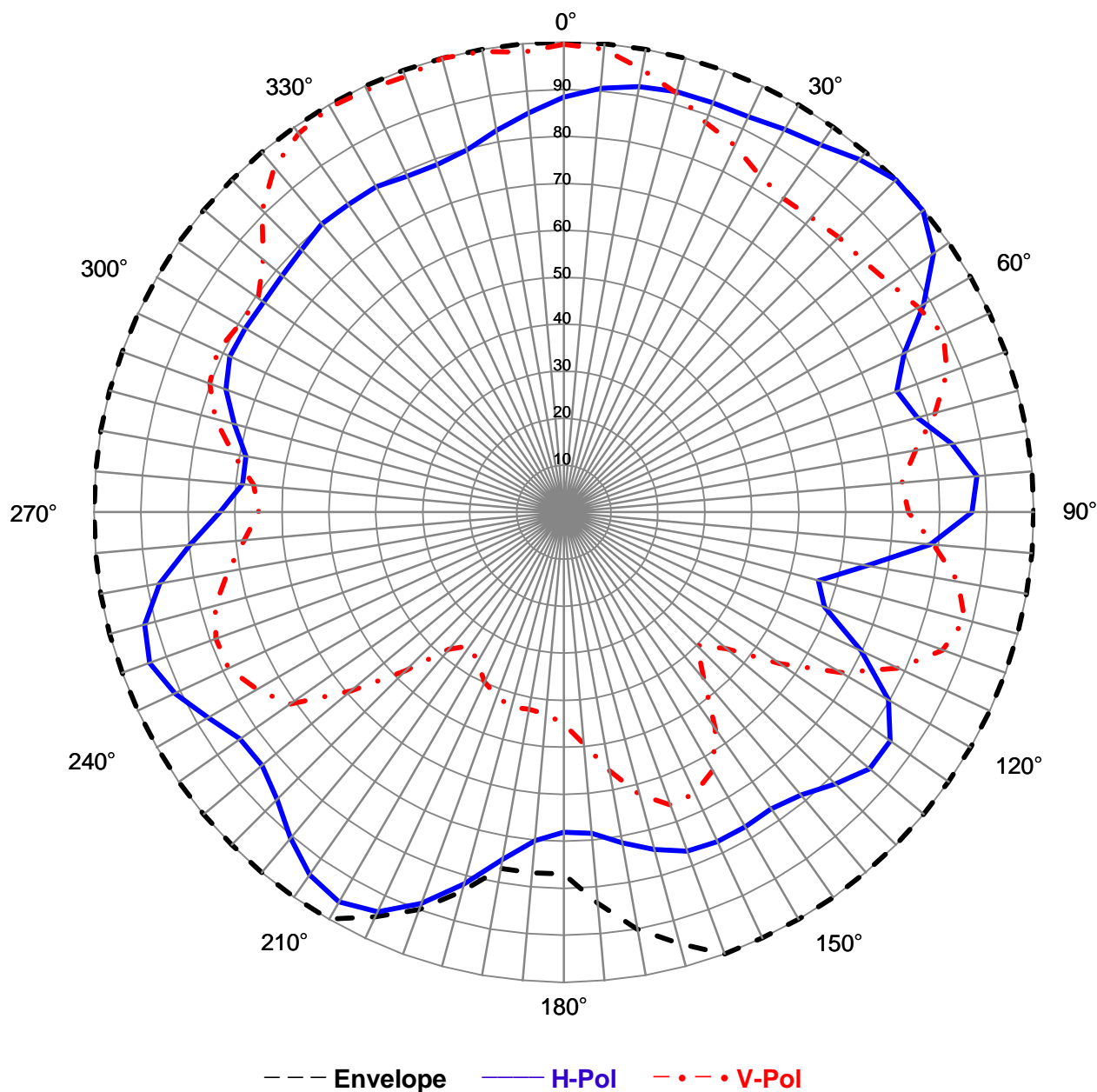
Location: Anniston, AL

Maximum ERP: 5.4 kW (7.32 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.995	5.35	7.28
10	0.957	4.95	6.94
20	0.928	4.65	6.67
30	0.941	4.78	6.80
40	0.979	5.18	7.14
50	0.998	5.38	7.31
60	0.884	4.22	6.25
70	0.868	4.07	6.09
80	0.838	3.79	5.79
90	0.868	4.07	6.09
100	0.852	3.92	5.93
110	0.857	3.97	5.98
120	0.798	3.44	5.36
130	0.849	3.89	5.90
140	0.785	3.33	5.22
150	0.772	3.22	5.08
160	0.767	3.18	5.02
170	0.714	2.75	4.40
180	0.680	2.50	3.97
190	0.750	3.04	4.83
200	0.886	4.24	6.27
210	0.958	4.96	6.95
220	0.904	4.41	6.45
230	0.838	3.79	5.79
240	0.875	4.13	6.16
250	0.938	4.75	6.77
260	0.873	4.12	6.14
270	0.733	2.90	4.63
280	0.714	2.75	4.40
290	0.802	3.47	5.41
300	0.797	3.43	5.35
310	0.835	3.77	5.76
320	0.958	4.96	6.95
330	0.994	5.34	7.27
340	0.987	5.26	7.21
350	0.995	5.35	7.28



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Field	Tower:	Pirod
Antenna Model:	PSIFM-3E-DA	Orientation:	0°
Polarization:	Circular	Frequency:	100.1 MHz
Gain (H-pol):	1.98 (2.97 dB)	Station:	WRHP
Gain (V-pol):	1.98 (2.97 dB)	Date:	11/20/2017

Measured Relative Field Tabulation

Antenna: PSIFM-3E-DA

Anniston Seventh-Day Adventist Church

Station: WRHP

Frequency: 100.1 MHz

Location: Anniston, AL

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.883	1.544	1.89
10	0.919	1.672	2.23
20	0.928	1.705	2.32
30	0.941	1.753	2.44
40	0.979	1.898	2.78
50	0.998	1.972	2.95
60	0.884	1.547	1.90
70	0.755	1.129	0.53
80	0.838	1.390	1.43
90	0.868	1.492	1.74
100	0.655	0.849	-0.71
110	0.590	0.689	-1.62
120	0.798	1.261	1.01
130	0.849	1.427	1.54
140	0.785	1.220	0.86
150	0.772	1.180	0.72
160	0.767	1.165	0.66
170	0.714	1.009	0.04
180	0.680	0.916	-0.38
190	0.750	1.114	0.47
200	0.886	1.554	1.92
210	0.958	1.817	2.59
220	0.904	1.618	2.09
230	0.838	1.390	1.43
240	0.875	1.516	1.81
250	0.938	1.742	2.41
260	0.873	1.509	1.79
270	0.733	1.064	0.27
280	0.687	0.934	-0.29
290	0.766	1.162	0.65
300	0.783	1.214	0.84
310	0.783	1.214	0.84
320	0.801	1.270	1.04
330	0.799	1.264	1.02
340	0.787	1.226	0.89
350	0.825	1.348	1.30

Maximum Value

Field 1.00
Gain 1.98 (2.97 dB)
Azimuth Bearing 45 degrees

Minimum Field

Field 0.561
Gain .623 (-2.05 dB)
Azimuth Bearing 105 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.995	1.960	2.92
10	0.957	1.813	2.58
20	0.883	1.544	1.89
30	0.829	1.361	1.34
40	0.819	1.328	1.23
50	0.833	1.374	1.38
60	0.872	1.506	1.78
70	0.868	1.492	1.74
80	0.760	1.144	0.58
90	0.734	1.067	0.28
100	0.852	1.437	1.58
110	0.857	1.454	1.63
120	0.682	0.921	-0.36
130	0.451	0.403	-3.95
140	0.463	0.424	-3.72
150	0.634	0.796	-0.99
160	0.663	0.870	-0.60
170	0.558	0.617	-2.10
180	0.450	0.401	-3.97
190	0.426	0.359	-4.45
200	0.417	0.344	-4.63
210	0.368	0.268	-5.72
220	0.380	0.286	-5.44
230	0.590	0.689	-1.62
240	0.754	1.126	0.51
250	0.788	1.229	0.90
260	0.726	1.044	0.19
270	0.649	0.834	-0.79
280	0.714	1.009	0.04
290	0.802	1.274	1.05
300	0.797	1.258	1.00
310	0.835	1.381	1.40
320	0.958	1.817	2.59
330	0.994	1.956	2.91
340	0.987	1.929	2.85
350	0.995	1.960	2.92

Maximum Value

Field 1.00
Gain 1.98 (2.97 dB)
Azimuth Bearing 345 degrees

Minimum Field

Field 0.347
Gain .238 (-6.22 dB)
Azimuth Bearing 215 degrees

ERP Tabulation

Antenna: PSIFM-3E-DA
Anniston Seventh-Day Adventist Church
Station: WRHP
Frequency: 100.1 MHz
Location: Anniston, AL
Maximum ERP: 5.4 kW (7.32 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.883	4.21	6.24
10	0.919	4.56	6.59
20	0.928	4.65	6.67
30	0.941	4.78	6.80
40	0.979	5.18	7.14
50	0.998	5.38	7.31
60	0.884	4.22	6.25
70	0.755	3.08	4.88
80	0.838	3.79	5.79
90	0.868	4.07	6.09
100	0.655	2.32	3.65
110	0.590	1.88	2.74
120	0.798	3.44	5.36
130	0.849	3.89	5.90
140	0.785	3.33	5.22
150	0.772	3.22	5.08
160	0.767	3.18	5.02
170	0.714	2.75	4.40
180	0.680	2.50	3.97
190	0.750	3.04	4.83
200	0.886	4.24	6.27
210	0.958	4.96	6.95
220	0.904	4.41	6.45
230	0.838	3.79	5.79
240	0.875	4.13	6.16
250	0.938	4.75	6.77
260	0.873	4.12	6.14
270	0.733	2.90	4.63
280	0.687	2.55	4.06
290	0.766	3.17	5.01
300	0.783	3.31	5.20
310	0.783	3.31	5.20
320	0.801	3.46	5.40
330	0.799	3.45	5.37
340	0.787	3.34	5.24
350	0.825	3.68	5.65

Maximum Value (H-pol)

Field 1.00
ERP 5.4 kW (7.32 dBk)
Azimuth Bearing 45 degrees

Minimum Field (H-pol)

Field 0.561
ERP .170 kW (2.30 dBk)
Azimuth Bearing 105 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.995	5.35	7.28
10	0.957	4.95	6.94
20	0.883	4.21	6.24
30	0.829	3.71	5.70
40	0.819	3.62	5.59
50	0.833	3.75	5.74
60	0.872	4.11	6.13
70	0.868	4.07	6.09
80	0.760	3.12	4.94
90	0.734	2.91	4.64
100	0.852	3.92	5.93
110	0.857	3.97	5.98
120	0.682	2.51	4.00
130	0.451	1.10	0.41
140	0.463	1.16	0.64
150	0.634	2.17	3.37
160	0.663	2.37	3.75
170	0.558	1.68	2.26
180	0.450	1.09	0.39
190	0.426	0.98	-0.09
200	0.417	0.94	-0.27
210	0.368	0.73	-1.36
220	0.380	0.78	-1.08
230	0.590	1.88	2.74
240	0.754	3.07	4.87
250	0.788	3.35	5.25
260	0.726	2.85	4.54
270	0.649	2.27	3.57
280	0.714	2.75	4.40
290	0.802	3.47	5.41
300	0.797	3.43	5.35
310	0.835	3.77	5.76
320	0.958	4.96	6.95
330	0.994	5.34	7.27
340	0.987	5.26	7.21
350	0.995	5.35	7.28

Maximum Value (V-pol)

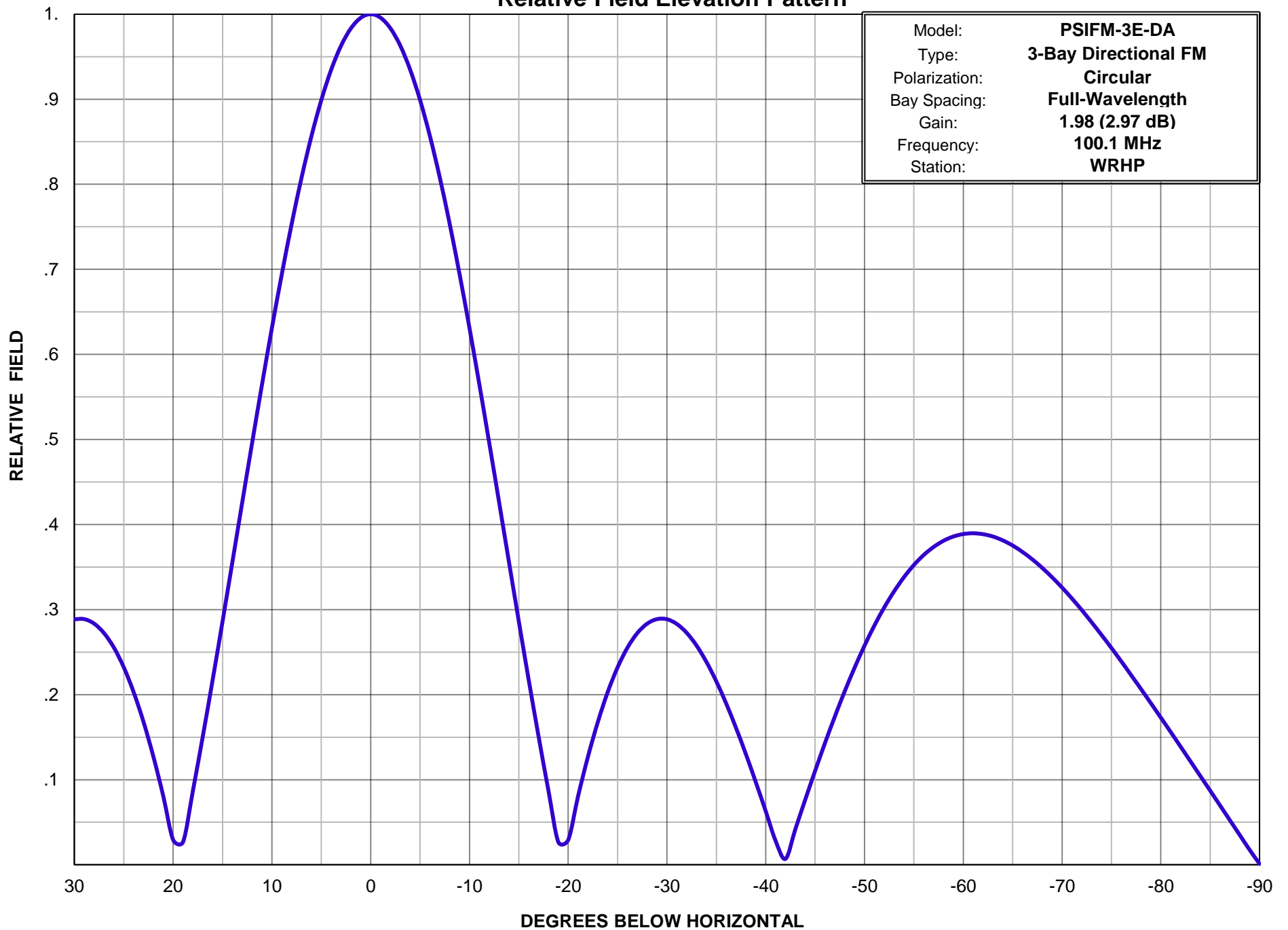
Field 1.00
ERP 5.4 kW (7.32 dBk)
Azimuth Bearing 345 degrees

Minimum Field (V-pol)

Field 0.347
ERP .650 kW (-1.87 dBk)
Azimuth Bearing 215 degrees



Relative Field Elevation Pattern





Propagation Systems Inc.

Elevation Pattern Tabulation

Antenna: PSIFM-3E-DA

Station: WRHP

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90.0	0.001	-60.000	-50.0	0.258	-11.782	-10.0	0.631	-3.999
-89.0	0.017	-35.177	-49.0	0.232	-12.697	-9.0	0.694	-3.170
-88.0	0.035	-29.156	-48.0	0.204	-13.804	-8.0	0.753	-2.460
-87.0	0.052	-25.634	-47.0	0.174	-15.169	-7.0	0.808	-1.855
-86.0	0.070	-23.136	-46.0	0.143	-16.882	-6.0	0.857	-1.345
-85.0	0.087	-21.198	-45.0	0.110	-19.136	-5.0	0.899	-0.925
-84.0	0.104	-19.626	-44.0	0.077	-22.308	-4.0	0.935	-0.588
-83.0	0.122	-18.297	-43.0	0.042	-27.541	-3.0	0.963	-0.329
-82.0	0.139	-17.143	-42.0	0.007	-43.136	-2.0	0.983	-0.146
-81.0	0.156	-16.134	-41.0	0.028	-31.047	-1.0	0.996	-0.037
-80.0	0.173	-15.238	-40.0	0.063	-24.030	0.0	1.000	0.000
-79.0	0.190	-14.432	-39.0	0.097	-20.281	1.0	0.996	-0.037
-78.0	0.207	-13.701	-38.0	0.130	-17.741	2.0	0.983	-0.146
-77.0	0.223	-13.039	-37.0	0.161	-15.885	3.0	0.963	-0.329
-76.0	0.239	-12.429	-36.0	0.189	-14.453	4.0	0.935	-0.587
-75.0	0.255	-11.874	-35.0	0.215	-13.333	5.0	0.899	-0.925
-74.0	0.270	-11.368	-34.0	0.238	-12.456	6.0	0.857	-1.345
-73.0	0.285	-10.903	-33.0	0.258	-11.782	7.0	0.808	-1.855
-72.0	0.299	-10.475	-32.0	0.273	-11.290	8.0	0.753	-2.459
-71.0	0.313	-10.088	-31.0	0.283	-10.963	9.0	0.694	-3.170
-70.0	0.326	-9.738	-30.0	0.289	-10.793	10.0	0.631	-3.996
-69.0	0.338	-9.425	-29.0	0.289	-10.788	11.0	0.565	-4.961
-68.0	0.349	-9.145	-28.0	0.283	-10.949	12.0	0.496	-6.084
-67.0	0.359	-8.900	-27.0	0.272	-11.295	13.0	0.427	-7.401
-66.0	0.368	-8.689	-26.0	0.255	-11.859	14.0	0.356	-8.970
-65.0	0.375	-8.512	-25.0	0.232	-12.686	15.0	0.286	-10.871
-64.0	0.381	-8.373	-24.0	0.203	-13.849	16.0	0.217	-13.254
-63.0	0.386	-8.270	-23.0	0.168	-15.500	17.0	0.151	-16.426
-62.0	0.389	-8.209	-22.0	0.127	-17.916	18.0	0.087	-21.198
-61.0	0.390	-8.185	-21.0	0.081	-21.856	19.0	0.027	-31.431
-60.0	0.389	-8.206	-20.0	0.029	-30.680	20.0	0.029	-30.680
-59.0	0.386	-8.270	-19.0	0.027	-31.481	21.0	0.081	-21.873
-58.0	0.381	-8.384	-18.0	0.087	-21.213	22.0	0.127	-17.926
-57.0	0.374	-8.551	-17.0	0.151	-16.434	23.0	0.168	-15.500
-56.0	0.364	-8.772	-16.0	0.217	-13.260	24.0	0.203	-13.855
-55.0	0.352	-9.059	-15.0	0.286	-10.871	25.0	0.232	-12.686
-54.0	0.338	-9.417	-14.0	0.356	-8.973	26.0	0.255	-11.859
-53.0	0.322	-9.856	-13.0	0.426	-7.404	27.0	0.272	-11.300
-52.0	0.303	-10.383	-12.0	0.496	-6.087	28.0	0.283	-10.949
-51.0	0.281	-11.019	-11.0	0.565	-4.961	29.0	0.289	-10.788