



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
WIKZ-FM
MLB-Hagerstown-Chambersburg IV, LLC
Chambersburg, PA
Updated 3-12-10**

A standard model PSIFHR antenna with parasitic elements was used in conjunction with a model of the customer's support mast to create the necessary directional radiation pattern. The final antenna consists of three radiating elements each secured to the mast with a custom-mounting bracket. The antenna bays are full wavelength spaced and there is a combination horizontal/vertical parasitic assembly mounted at each bay level and one horizontal parasitic mounted to the boom of each bay. The antenna array is end 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 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 8753A-network analyzer operating at 285.3 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 96.4% of the envelope RMS.

The antenna is to be mounted 137 meters (449.4 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 support mast and positioned 270° True and certified by a licensed surveyor. It is recommended that a broadcast engineer is present to supervise 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 16.39 kW will be required at the antenna input in order to reach the licensed 50 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

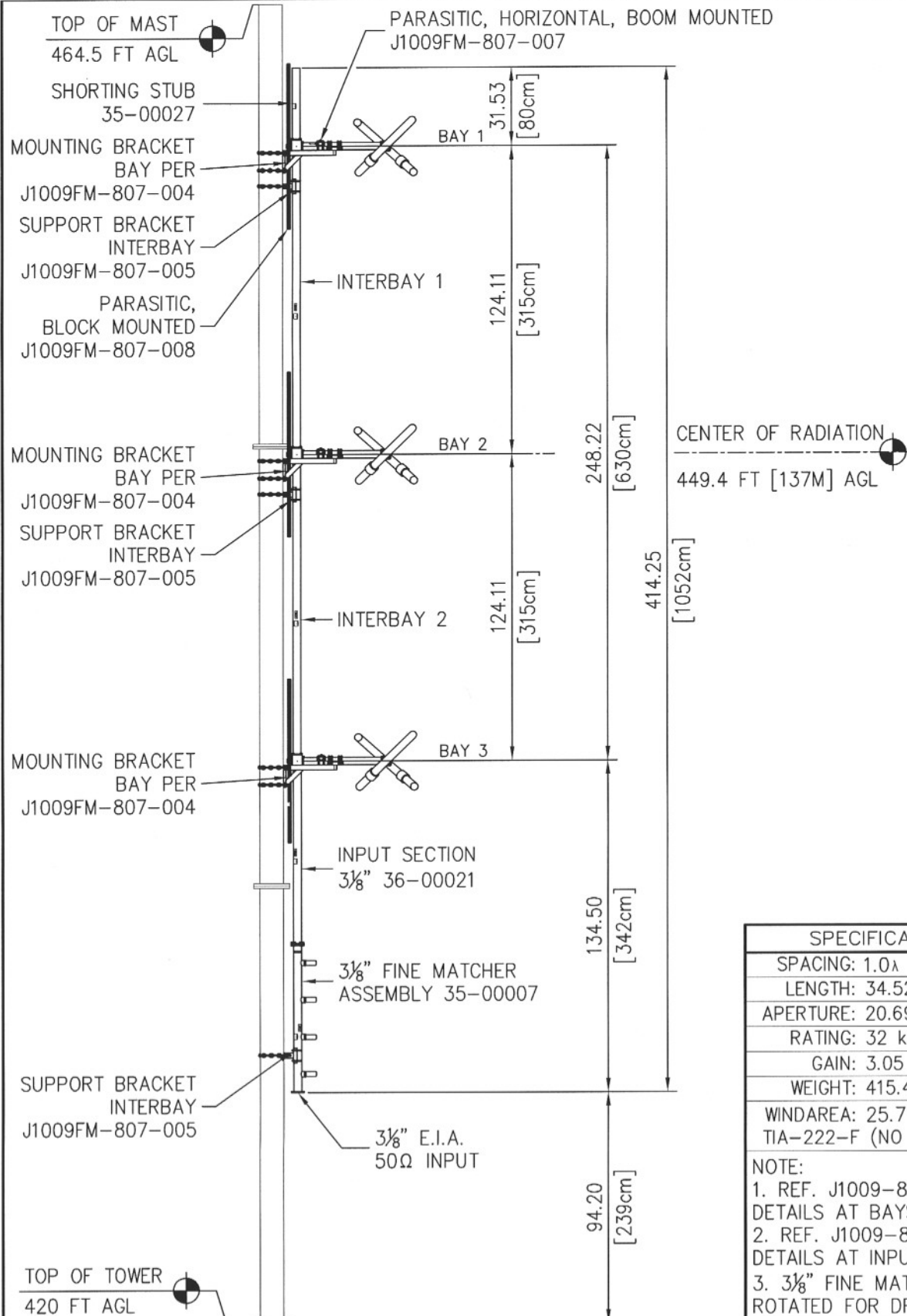
Antenna Model	PSIFHR-3-DA
Type	3-bay directional FM antenna
Bay Spacing	Full wavelength spaced elements
Frequency	95.1 MHz
Polarization	Circular
Envelope RMS	.742
Composite RMS	.715
Gain (h-pol)	3.05 (4.84 dB)
Gain (v-pol)	3.05 (4.84 dB)
Input	3-1/8" EIA end fed input
Input power	17.12 kW
Power rating	32 kW
Length	34.52 ft.
Weight	393 lbs.
Wind Area	25.3 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.



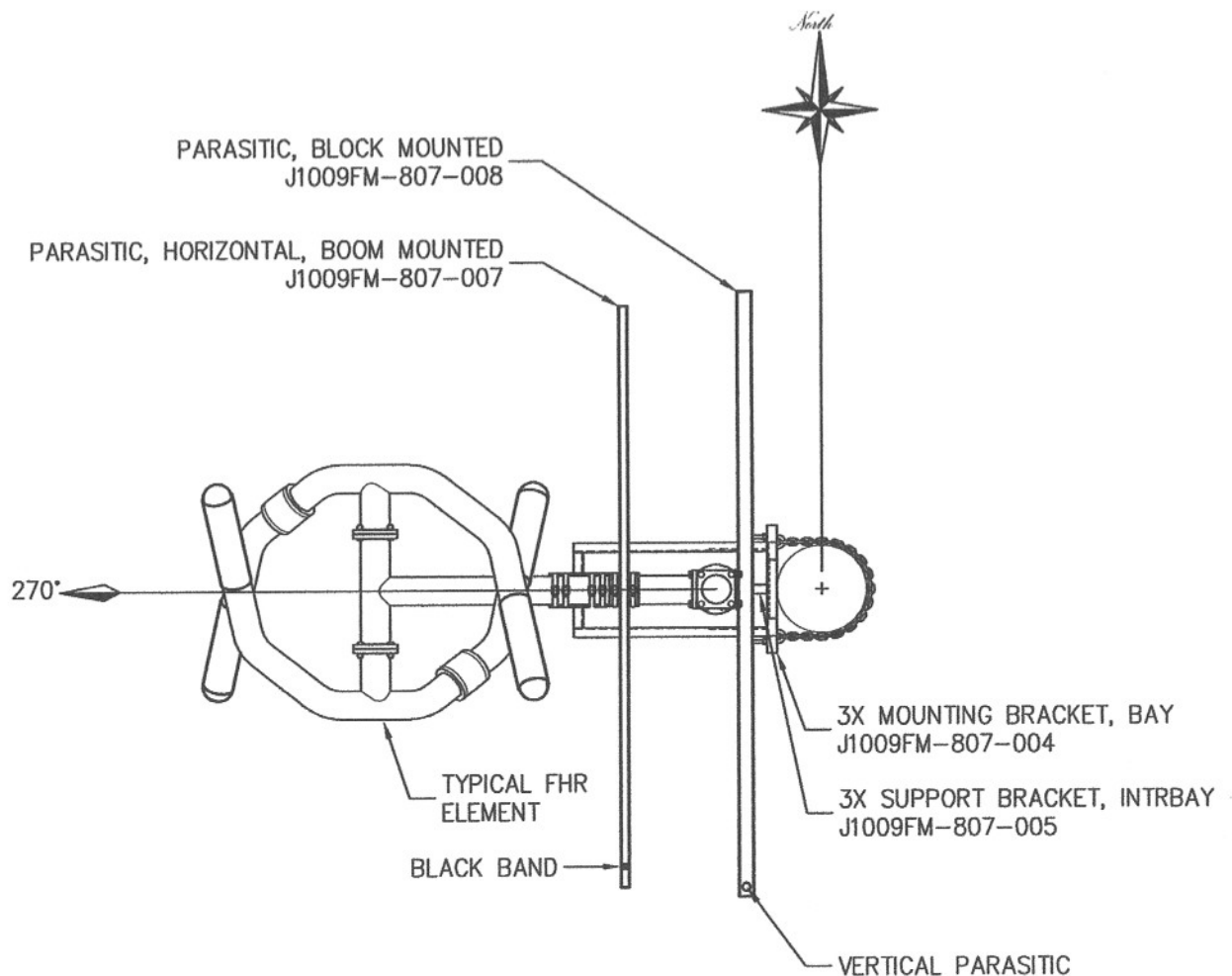
Douglas A. Ross
President
Propagation Systems Inc.



SPECIFICATIONS	
SPACING: 1.0λ	
LENGTH: 34.52 Ft [10.52M]	
APERTURE: 20.69 Ft [6.30M]	
RATING: 32 kW	
GAIN: 3.05 (4.84 dB)	
WEIGHT: 415.4 LB [188.8 Kg]	
WINDAREA: 25.7 Ft ²	
TIA-222-F (NO ICE)	
NOTE:	
1. REF. J1009-807-009 FOR ASSEMBLY DETAILS AT BAYS 1 AND 2	
2. REF. J1009-807-010 FOR ASSEMBLY DETAILS AT INPUT	
3. 3/8" FINE MATCHER 35-00007 IS SHOWN ROTATED FOR DRAWING CLARITY	

A		D.G. Keller	3/12/10	CORRECT GAIN NUMBER
REV.	MADE BY	CHECKED BY	DATE	CHANGE
This drawing is loaned subject to the express understanding and agreement that the drawing and information therein contained are, and shall remain the property of PSI, and will not be otherwise utilized or disposed of, directly or indirectly, and will not be used in whole or in part or assist in making or finish any information for the making of drawings, prints or other reproductions hereof, or for the design or making of any item, parts, object, apparatus or parts thereof, except upon the written permissions of PSI first obtained. The acceptance of this drawing will be construed as an acceptance of the forgoing agreement.				
SIZE		A		

PROPAGATION SYSTEMS, INC.			
Ebensburg, Pennsylvania USA 814-472-5540			
ANTENNA ELEVATIONS AND SPECIFICATIONS			
MODEL:	PSIFHR-3-DA	DRAWN BY:	D.G. Keller
CHANNEL/FREQUENCY:	95.1 MHz	APPROVED BY:	
SCALE:	1:60	DRAWING NO.:	J1009FM-807-001
			REV. A



PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

FHR POWER-TILLER™ PLAN VIEW AND ORIENTATION

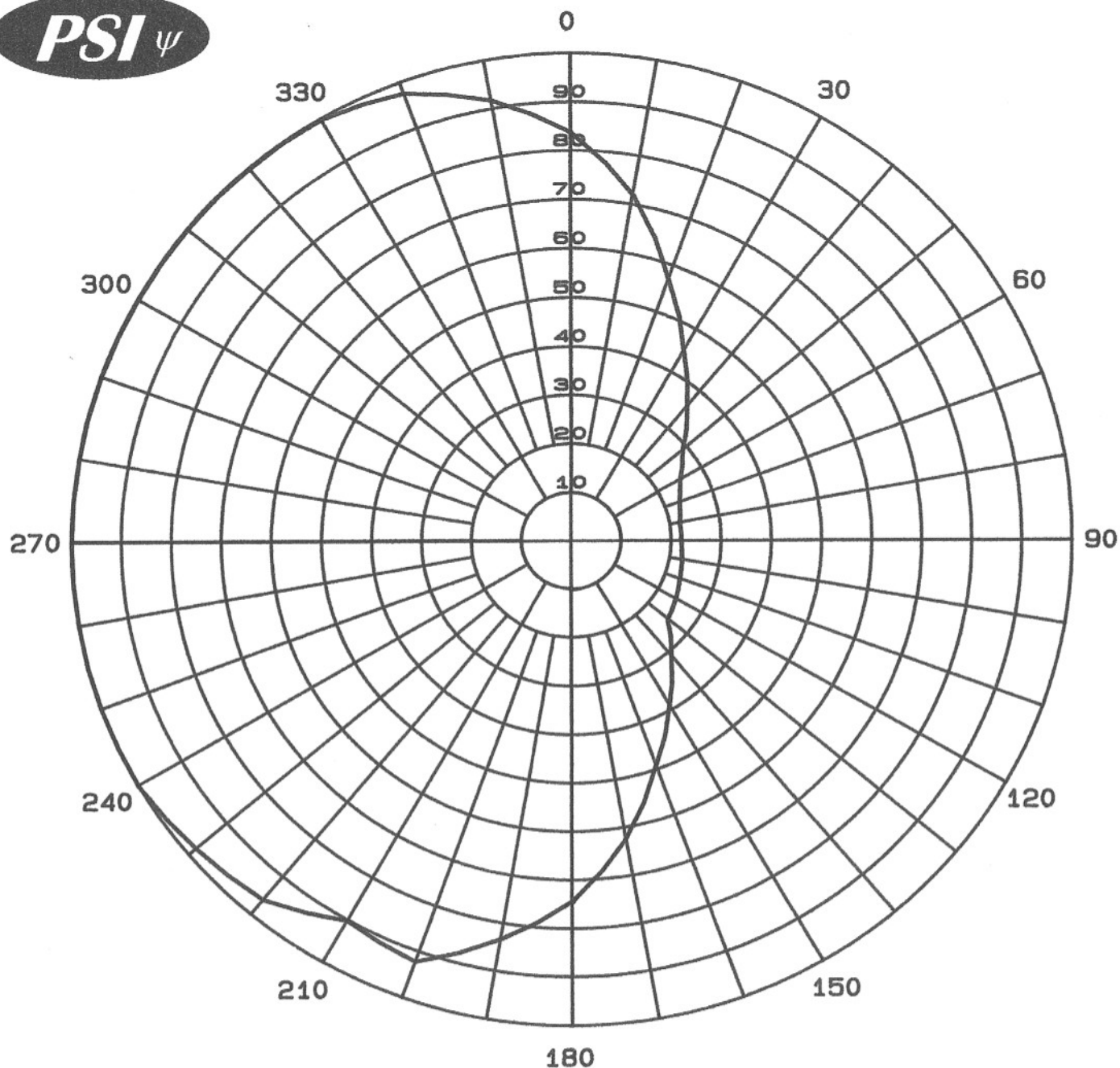
MODEL:	PSIFHR-3-DA	DRAWN BY:	D.G. Kellar	DATE:	10/14/09
CHANNEL/ FREQUENCY:	95.1 MHz	APPROVED BY:		DATE:	
SCALE:	1:20	DRAWING NO.:	J1009FM-807-002	REV.	

REV. MADE BY CHECKED BY DATE CHANGE

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SIZE

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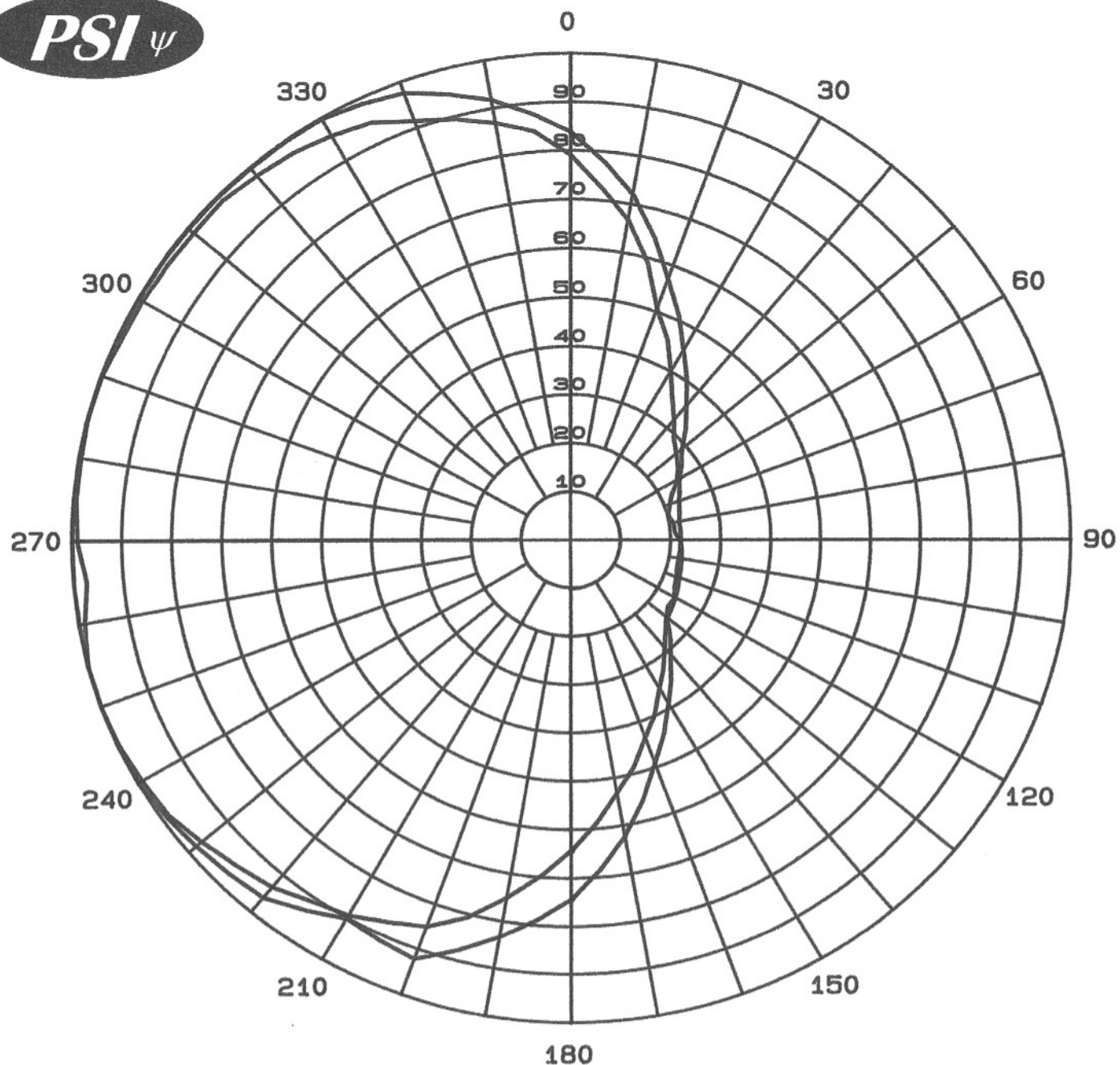
Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFHR-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 50 kW (16.99 dBk)
RMS Envelope: .742
Frequency: 95.1 MHz
WIKZ Chambersburg, PA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Maximum Envelope Tabulation

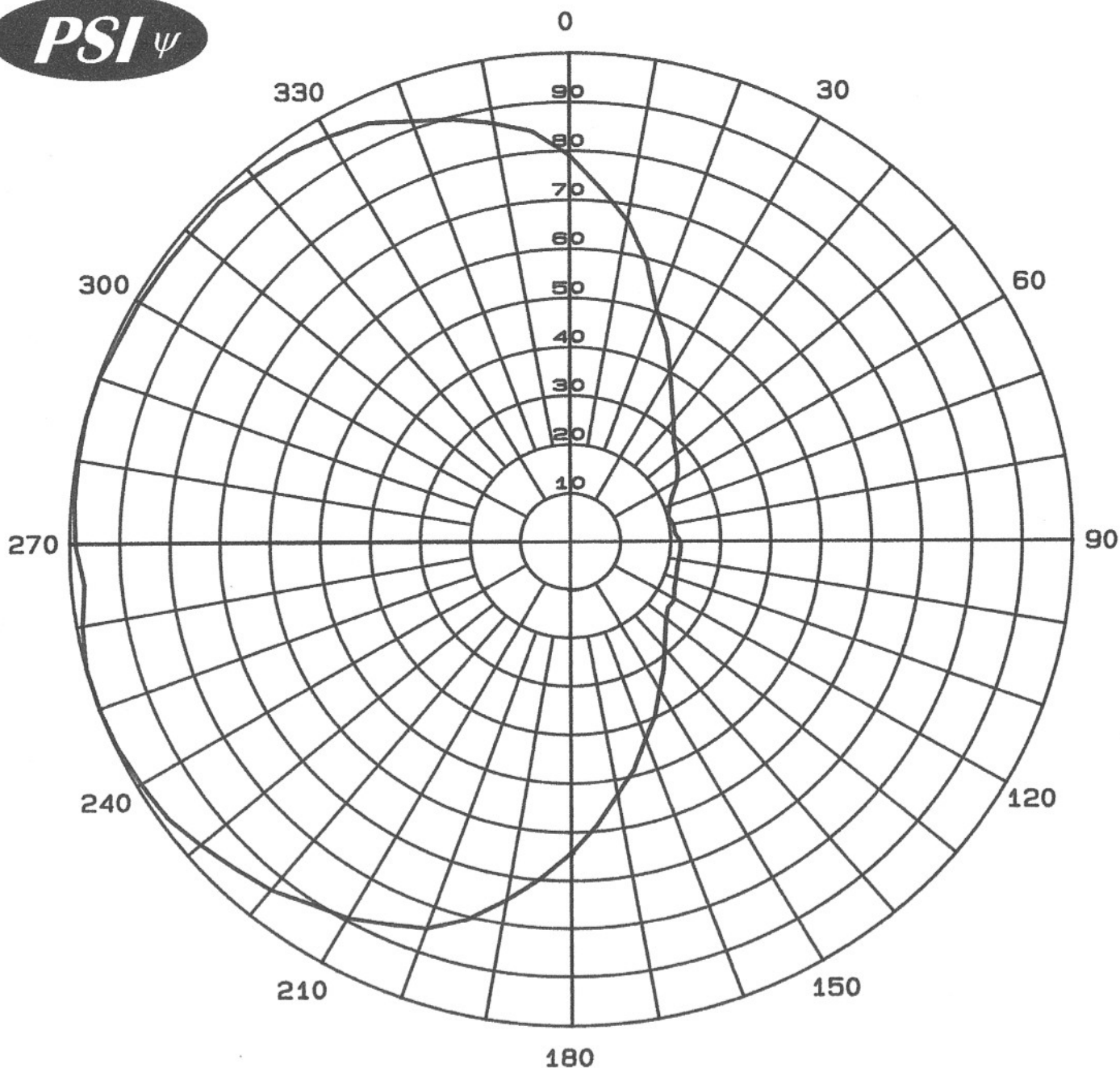
Antenna: PSIFHR-3-DA
MLB-Hagerstown-Chambersburg IV, LLC
Station: WIKZ
Frequency: 95.1 MHz
Location: Chambersburg, PA
Maximum ERP: 50 kW (16.99 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.840	35.28	15.48
10	0.720	25.92	14.14
20	0.570	16.25	12.11
30	0.450	10.13	10.05
40	0.360	6.48	8.12
50	0.290	4.21	6.24
60	0.250	3.13	4.95
70	0.230	2.65	4.22
80	0.220	2.42	3.84
90	0.220	2.42	3.84
100	0.225	2.53	4.03
110	0.230	2.65	4.22
120	0.240	2.88	4.59
130	0.250	3.13	4.95
140	0.310	4.81	6.82
150	0.390	7.61	8.81
160	0.490	12.01	10.79
165	0.620	19.22	12.84
170	0.740	27.38	14.37
180	0.830	34.45	15.37
190	0.920	42.32	16.27
200	0.900	40.50	16.07
210	0.960	46.08	16.64
220	0.980	48.02	16.81
230	1.000	50.00	16.99
240	1.000	50.00	16.99
250	1.000	50.00	16.99
260	1.000	50.00	16.99
270	1.000	50.00	16.99
280	1.000	50.00	16.99
290	1.000	50.00	16.99
300	1.000	50.00	16.99
310	1.000	50.00	16.99
320	1.000	50.00	16.99
330	1.000	50.00	16.99
340	0.980	48.02	16.81
350	0.920	42.32	16.27



Maximum Envelope and
Composite Pattern
Antenna: PSIFHR-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 50 kW (16.99 dBk)
RMS Envelope: .742
RMS Composite: 715
WIKZ Chambersburg, PA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFHR-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 50 kW (16.99 dBk)
Frequency: 95.1 MHz
RMS Composite: 715
WIKZ Chambersburg, PA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFHR-3-DA

MLB-Hagerstown-Chambersburg IV, LLC

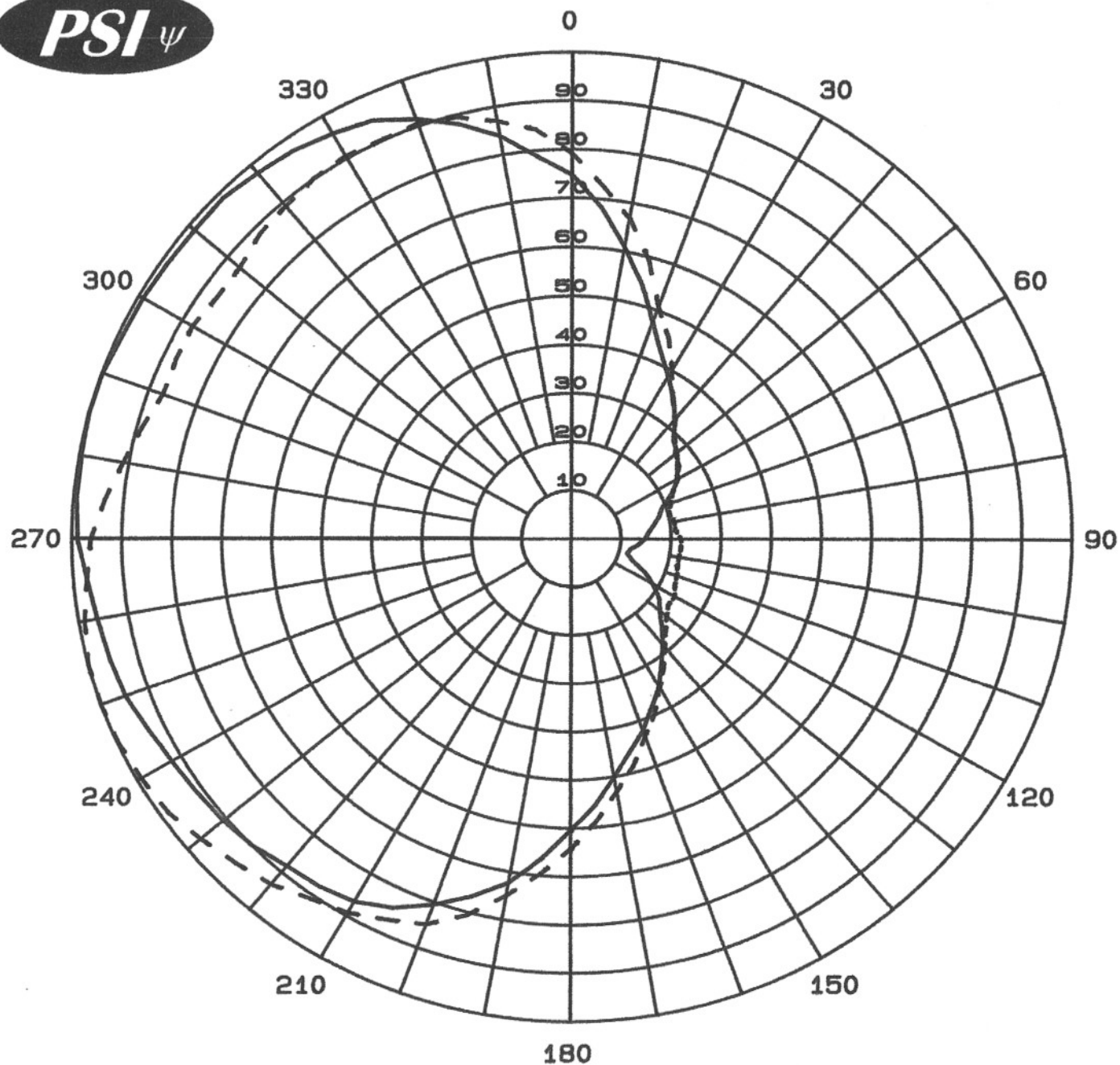
Station: WIKZ

Frequency: 95.1 MHz

Location: Chambersburg, PA

Maximum ERP: 50 kW (16.99 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.792	31.36	14.96
10	0.667	22.24	13.47
20	0.505	12.75	11.06
30	0.399	7.96	9.01
40	0.321	5.15	7.12
50	0.276	3.81	5.81
60	0.245	3.00	4.77
70	0.210	2.21	3.43
80	0.208	2.16	3.35
90	0.220	2.42	3.84
100	0.219	2.40	3.80
110	0.224	2.51	3.99
120	0.239	2.86	4.56
130	0.249	3.10	4.91
140	0.292	4.26	6.30
150	0.354	6.27	7.97
160	0.434	9.42	9.74
170	0.529	13.99	11.46
180	0.640	20.48	13.11
190	0.748	27.98	14.47
200	0.848	35.96	15.56
210	0.893	39.87	16.01
220	0.932	43.43	16.38
230	0.966	46.66	16.69
240	0.991	49.10	16.91
250	1.000	50.00	16.99
260	0.989	48.91	16.89
270	0.989	48.91	16.89
280	0.996	49.60	16.95
290	0.999	49.90	16.98
300	0.991	49.10	16.91
310	0.986	48.61	16.87
320	0.979	47.92	16.81
330	0.960	46.08	16.64
340	0.918	42.14	16.25
350	0.871	37.93	15.79



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFHR-3-DA
Type: 3-Bay Directional FM Antenna
Gain H-pol (solid): 3.05 (4.84 dB)
Gain V-pol (dash): 3.05 (4.84 dB)
Frequency: 95.1 MHz
WIKZ Chambersburg, PA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFHR-3-DA

MLB-Hagerstown-Chambersburg IV, LLC

Station: WIKZ

Frequency: 95.1 MHz

Location: Chambersburg, PA

Updated 3-12-10

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.748	1.706	2.32
10	0.607	1.124	0.51
20	0.472	0.679	-1.68
30	0.385	0.452	-3.45
40	0.321	0.314	-5.03
50	0.276	0.232	-6.34
60	0.245	0.183	-7.37
70	0.194	0.115	-9.40
80	0.167	0.085	-10.70
90	0.147	0.066	-11.81
100	0.120	0.044	-13.57
110	0.130	0.052	-12.88
120	0.189	0.109	-9.63
130	0.231	0.163	-7.88
140	0.285	0.248	-6.06
150	0.351	0.376	-4.25
160	0.421	0.541	-2.67
170	0.499	0.759	-1.19
180	0.602	1.105	0.43
190	0.721	1.586	2.00
200	0.805	1.976	2.96
210	0.866	2.287	3.59
220	0.883	2.378	3.76
230	0.907	2.509	4.00
240	0.921	2.587	4.13
250	0.948	2.741	4.38
260	0.962	2.823	4.51
270	0.989	2.983	4.75
280	0.996	3.026	4.81
290	0.999	3.044	4.83
300	0.991	2.995	4.76
310	0.986	2.965	4.72
320	0.979	2.923	4.66
330	0.960	2.811	4.49
340	0.918	2.570	4.10
350	0.841	2.157	3.34

Maximum Value

Field 1.00

Gain 3.05 (4.84 dB)

Azimuth Bearing 285 degrees

Minimum Field

Field 0.115

Gain .040 (-13.94 dB)

Azimuth Bearing 105 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.792	1.913	2.82
10	0.667	1.357	1.33
20	0.505	0.778	-1.09
30	0.399	0.486	-3.14
40	0.321	0.314	-5.03
50	0.271	0.224	-6.50
60	0.243	0.180	-7.44
70	0.210	0.135	-8.71
80	0.208	0.132	-8.80
90	0.220	0.148	-8.31
100	0.219	0.146	-8.35
110	0.224	0.153	-8.15
120	0.239	0.174	-7.59
130	0.249	0.189	-7.23
140	0.292	0.260	-5.85
150	0.354	0.382	-4.18
160	0.434	0.574	-2.41
170	0.529	0.854	-0.69
180	0.640	1.249	0.97
190	0.748	1.706	2.32
200	0.848	2.193	3.41
210	0.893	2.432	3.86
220	0.932	2.649	4.23
230	0.966	2.846	4.54
240	0.991	2.995	4.76
250	1.000	3.050	4.84
260	0.989	2.983	4.75
270	0.962	2.823	4.51
280	0.911	2.531	4.03
290	0.871	2.314	3.64
300	0.877	2.346	3.70
310	0.868	2.298	3.61
320	0.892	2.427	3.85
330	0.906	2.504	3.99
340	0.907	2.509	4.00
350	0.871	2.314	3.64

Maximum Value

Field 1.00

Gain 3.05 (4.84 dB)

Azimuth Bearing 250-255 degrees

Minimum Field

Field 0.201

Gain .123 (-9.09 dB)

Azimuth Bearing 75 degrees

ERP Tabulation

Antenna: PSIFHR-3-DA
MLB-Hagerstown-Chambersburg IV, LLC
Station: WIKZ
Frequency: 95.1 MHz
Location: Chambersburg, PA
Maximum ERP: 50 kW (16.99 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.748	27.98	14.47
10	0.607	18.42	12.65
20	0.472	11.14	10.47
30	0.385	7.41	8.70
40	0.321	5.15	7.12
50	0.276	3.81	5.81
60	0.245	3.00	4.77
70	0.194	1.88	2.75
80	0.167	1.39	1.44
90	0.147	1.08	0.34
100	0.120	0.72	-1.43
110	0.130	0.85	-0.73
120	0.189	1.79	2.52
130	0.231	2.67	4.26
140	0.285	4.06	6.09
150	0.351	6.16	7.90
160	0.421	8.86	9.48
170	0.499	12.45	10.95
180	0.602	18.12	12.58
190	0.721	25.99	14.15
200	0.805	32.40	15.11
210	0.866	37.50	15.74
220	0.883	38.98	15.91
230	0.907	41.13	16.14
240	0.921	42.41	16.27
250	0.948	44.94	16.53
260	0.962	46.27	16.65
270	0.989	48.91	16.89
280	0.996	49.60	16.95
290	0.999	49.90	16.98
300	0.991	49.10	16.91
310	0.986	48.61	16.87
320	0.979	47.92	16.81
330	0.960	46.08	16.64
340	0.918	42.14	16.25
350	0.841	35.36	15.49

Maximum Value (H-pol)

Field 1.00
ERP 50.0 kW (16.99 dBk)
Azimuth Bearing 285 degrees

Minimum Field (H-pol)

Field 0.115
ERP .66 kW (-1.80 dBk)
Azimuth Bearing 105 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.792	31.36	14.96
10	0.667	22.24	13.47
20	0.505	12.75	11.06
30	0.399	7.96	9.01
40	0.321	5.15	7.12
50	0.271	3.67	5.65
60	0.243	2.95	4.70
70	0.210	2.21	3.43
80	0.208	2.16	3.35
90	0.220	2.42	3.84
100	0.219	2.40	3.80
110	0.224	2.51	3.99
120	0.239	2.86	4.56
130	0.249	3.10	4.91
140	0.292	4.26	6.30
150	0.354	6.27	7.97
160	0.434	9.42	9.74
170	0.529	13.99	11.46
180	0.640	20.48	13.11
190	0.748	27.98	14.47
200	0.848	35.96	15.56
210	0.893	39.87	16.01
220	0.932	43.43	16.38
230	0.966	46.66	16.69
240	0.991	49.10	16.91
250	1.000	50.00	16.99
260	0.989	48.91	16.89
270	0.962	46.27	16.65
280	0.911	41.50	16.18
290	0.871	37.93	15.79
300	0.877	38.46	15.85
310	0.868	37.67	15.76
320	0.892	39.78	16.00
330	0.906	41.04	16.13
340	0.907	41.13	16.14
350	0.871	37.93	15.79

Maximum Value (V-pol)

Field 1.00
ERP 50.0 kW (16.99 dBk)
Azimuth Bearing 250-255 degrees

Minimum Field (V-pol)

Field 0.201
ERP 2.02 kW (3.05 dBk)
Azimuth Bearing 75 degrees

