



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
WIRE
Hoosier Broadcasting Corporation
Lebanon, IN**

A modified PSIFMV antenna element was used in conjunction with the customer's 36.5" triangular face tower to create the necessary directional radiation pattern. The final antenna consists of three vertically polarized radiating elements each spaced one wavelength and fed with equal power and phase. Each bay has four vertical parasitic elements to shape the azimuth pattern. The antenna is secured to the tower with custom-mounting brackets. The antenna bays are fed from a 1-5/8" rigid inter-bay connection.

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 273.3 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 89.8% of the envelope RMS.

The antenna is to be mounted with the center of radiation at 56 meters (183.68 ft) above ground level on the southeast tower leg. At this elevation the antenna will be within the allowed +2m/-4m tolerance allowed by the FCC and will have sufficient clearance above and below the existing antennas mounted to the tower. No other antenna can be mounted within the aperture of this directional antenna. The antenna is to be positioned 126° True according to the enclosed instructions and will require verification by a licensed surveyor.

It is recommended that a broadcast engineer be present to supervise the installation of the antenna and that he or she certifies the antenna has been installed according to the enclosed instructions. It is also recommended any metallic guy wire that passes with 25 ft. of any radiating element be replaced with the appropriate non-metallic guy substitute.


An input power level of .462 kW will be required at the antenna input in order to reach the licensed 3.2 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

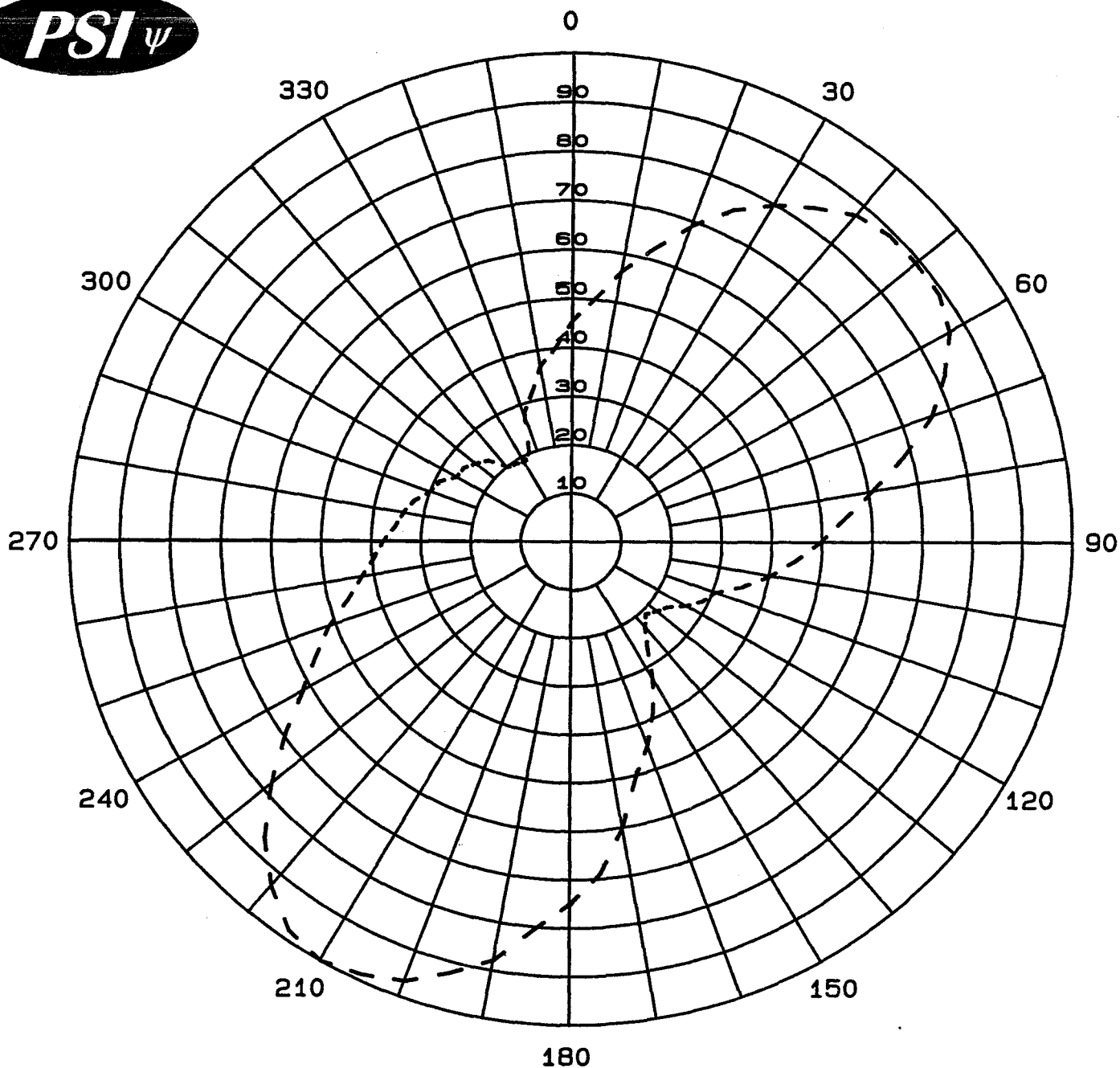
Antenna Model	PSIFMV-3-DA
Type	3-bay directional FM antenna
Bay Spacing	full wave spaced elements
Frequency	91.1 MHz
Polarization	Vertical
Envelope RMS	.657
Measured RMS	.590
Gain	6.93 (8.41 dB)
ERP	3.2 kW (5.05 dBk)
Input Power	.462 kW
Input Type	1-5/8" EIA end fed
Power Rating	9 kW
Length	33.6 ft.
Weight	256.3 lbs.
Wind Area	27.3 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.

 5/12/07

Douglas A. Ross
President
Propagation Systems Inc.



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFMV-3-DA
Type: 3-Bay Directional FM Antenna
Polarization: Vertical
Gain: 6.93 (8.41 dB)
Station: WIRE
Location: Lebanon, IN

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PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFMV-3-DA

Station: WIRE

Frequency: 91.1 MHz

Location: Lebanon, IN

Vertical Component
Measured Relative Field

Angle	Relative Field	Power Gain	Gain dB
0	0.455	1.43	1.57
10	0.565	2.21	3.45
20	0.689	3.29	5.17
30	0.799	4.42	6.46
40	0.876	5.32	7.26
50	0.891	5.50	7.40
60	0.867	5.21	7.17
70	0.762	4.02	6.05
80	0.607	2.55	4.07
90	0.495	1.70	2.30
100	0.399	1.10	0.43
110	0.303	0.64	-1.96
120	0.260	0.47	-3.30
130	0.221	0.34	-4.70
140	0.227	0.36	-4.47
150	0.325	0.73	-1.36
160	0.446	1.38	1.39
170	0.598	2.48	3.94
180	0.747	3.87	5.87
190	0.876	5.32	7.26
200	0.966	6.47	8.11
210	1.000	6.93	8.41
220	0.931	6.01	7.79
230	0.783	4.25	6.28
240	0.621	2.67	4.27
250	0.517	1.85	2.68
260	0.427	1.26	1.02
270	0.377	0.98	-0.07
280	0.342	0.81	-0.91
290	0.301	0.63	-2.02
300	0.266	0.49	-3.10
310	0.250	0.43	-3.63
320	0.201	0.28	-5.53
330	0.189	0.25	-6.06
340	0.282	0.55	-2.59
350	0.368	0.94	-0.28

Maximum Field (V-pol)

Field 1.00

Gain 6.93 (8.41 dB)

Azimuth Bearing 210 degrees

Minimum Field (V-pol)

Field 0.189

Gain .25 (-6.06 dB)

Azimuth Bearing 330 degrees

ERP Tabulation

Antenna: PSIFMV-3-DA

Station: WIRE

Frequency: 91.1 MHz

Location: Lebanon, IN

Maximum ERP: 3.2 kW (5.05 dBk)

Vertical Component

Angle	Relative Field	ERP kW	ERP dBk
0	0.455	0.66	-1.79
10	0.565	1.02	0.09
20	0.689	1.52	1.82
30	0.799	2.04	3.10
40	0.876	2.46	3.90
50	0.891	2.54	4.05
60	0.867	2.41	3.81
70	0.762	1.86	2.69
80	0.607	1.18	0.72
90	0.495	0.78	-1.06
100	0.399	0.51	-2.93
110	0.303	0.29	-5.32
120	0.260	0.22	-6.65
130	0.221	0.16	-8.06
140	0.227	0.16	-7.83
150	0.325	0.34	-4.71
160	0.446	0.64	-1.96
170	0.598	1.14	0.59
180	0.747	1.79	2.52
190	0.876	2.46	3.90
200	0.966	2.99	4.75
210	1.000	3.20	5.05
220	0.931	2.77	4.43
230	0.783	1.96	2.93
240	0.621	1.23	0.91
250	0.517	0.86	-0.68
260	0.427	0.58	-2.34
270	0.377	0.45	-3.42
280	0.342	0.37	-4.27
290	0.301	0.29	-5.38
300	0.266	0.23	-6.45
310	0.250	0.20	-6.99
320	0.201	0.13	-8.88
330	0.189	0.11	-9.42
340	0.282	0.25	-5.94
350	0.368	0.43	-3.63

Maximum ERP (V-pol)

Field 1.00

ERP 3.2 kW (5.05 dBk)

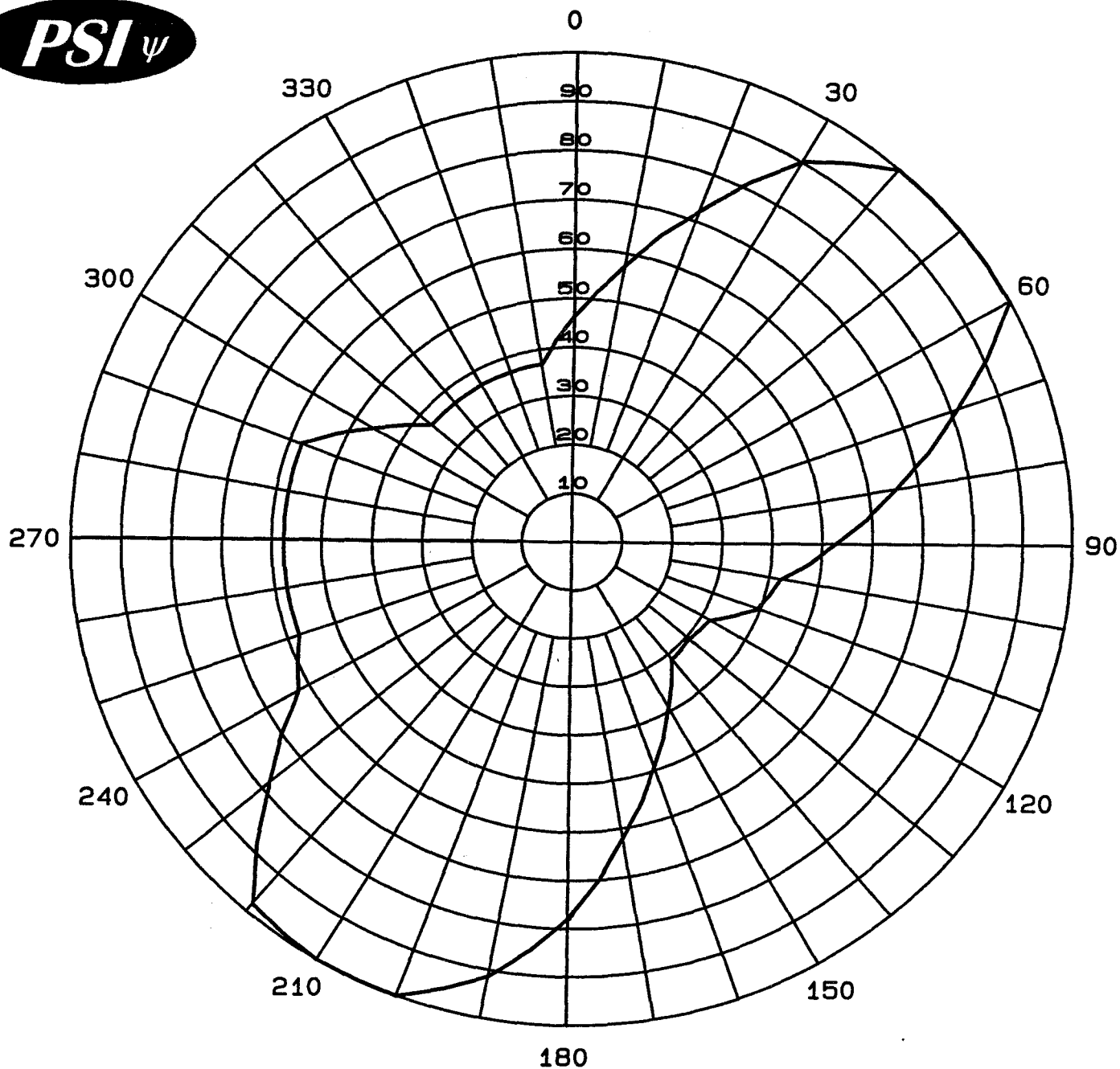
Azimuth Bearing 210 degrees

Minimum ERP

Field 0.189

ERP .11 kW (-9.42 dBk)

Azimuth Bearing 330 degrees



Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFMV-3-DA
Type: 3-Bay Directional FM Antenna
Polarization: Vertical
ERP: 3.2 (5.05 dB)
Station: WIRE
Location: Lebanon, IN

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Envelope Pattern

Antenna: PSIFMV-3-DA

Station: WIRE

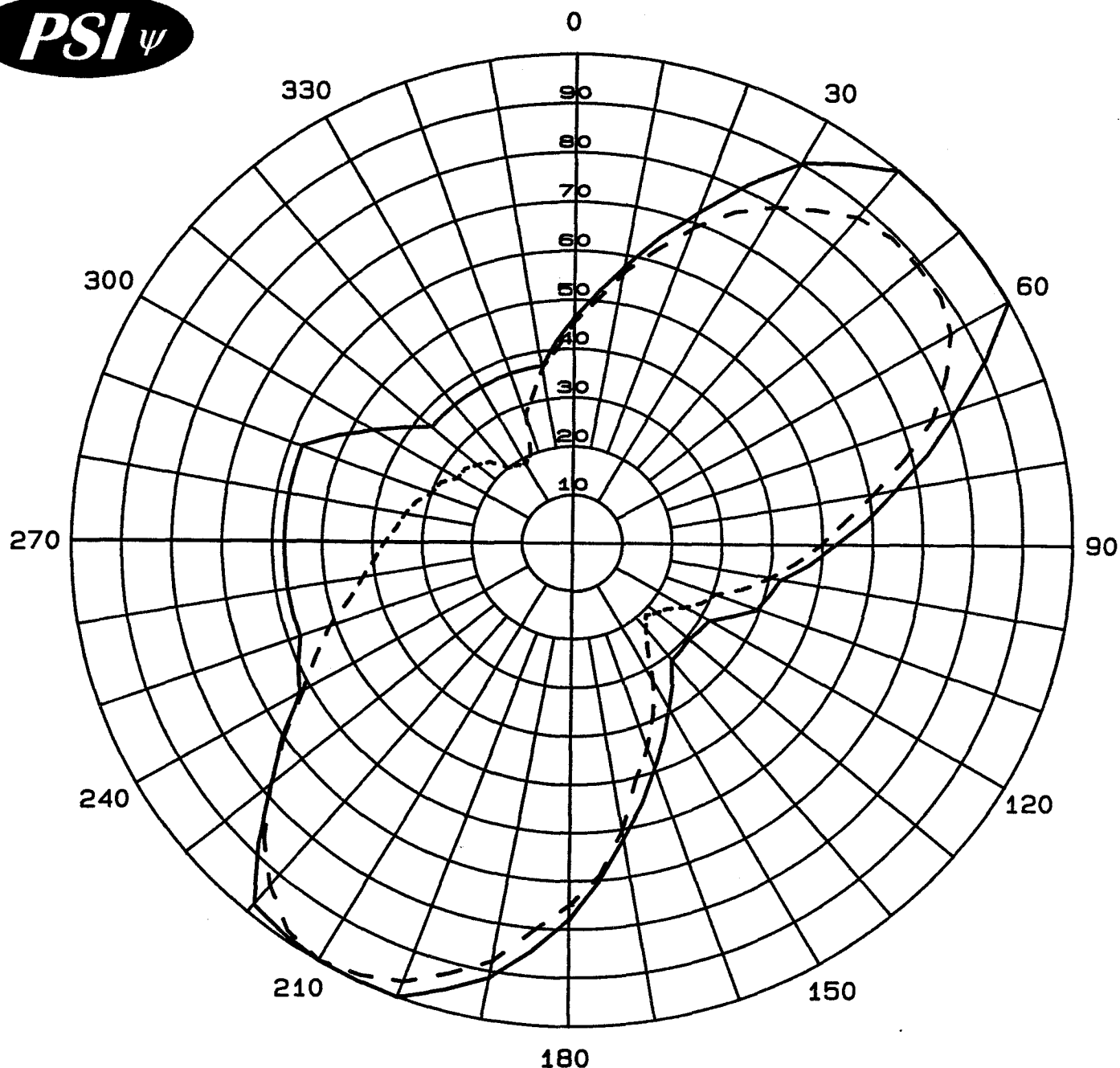
Frequency: 91.1 MHz

Location: Lebanon, IN

Maximum ERP: 3.2 kW (5.05 dBk)

Vertical Component

Angle	Relative Field	ERP kW	ERP dBk
0	0.464	0.69	-1.62
10	0.577	1.07	0.28
20	0.722	1.67	2.22
30	0.904	2.62	4.17
40	1.000	3.20	5.05
50	1.000	3.20	5.05
60	1.000	3.20	5.05
70	0.812	2.11	3.24
80	0.652	1.36	1.34
90	0.524	0.88	-0.56
100	0.421	0.57	-2.46
110	0.392	0.49	-3.08
120	0.316	0.32	-4.95
130	0.305	0.30	-5.26
140	0.312	0.31	-5.07
150	0.391	0.49	-3.10
160	0.491	0.77	-1.13
170	0.617	1.22	0.86
180	0.776	1.93	2.85
190	0.911	2.66	4.24
200	1.000	3.20	5.05
210	1.000	3.20	5.05
220	0.981	3.08	4.88
230	0.783	1.96	2.93
240	0.626	1.25	0.98
250	0.577	1.07	0.28
260	0.577	1.07	0.28
270	0.577	1.07	0.28
280	0.577	1.07	0.28
290	0.577	1.07	0.28
300	0.461	0.68	-1.67
310	0.370	0.44	-3.58
320	0.370	0.44	-3.58
330	0.370	0.44	-3.58
340	0.370	0.44	-3.58
350	0.370	0.44	-3.58



Maximum Envelope and
Measured Azimuth Plane Pattern
Antenna: PSIFMV-3-DA
Type: 3-Bay Directional FM Antenna
RMS Envelope: .657
RMS Measured Pattern: .590
Station: WIRE
Location: Lebanon, IN

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