



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
WVRS
Timber Ridge Ministries
Gore, VA**

A standard model PSIFML antenna with parasitic elements was used in conjunction with the customer's 32" face triangular tower to create the necessary directional radiation pattern. The final antenna consists of one radiating element secured to a custom support mast mounted to the northwest tower face. The antenna includes two vertical and one horizontal parasitic elements. The antenna has a Type "N" female input.

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 270.3 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 85.8% of the envelope RMS.

The antenna is to be mounted 35 meters (114 ft.) above ground level on the northwest face of the tower and positioned 300° True. At this elevation the antenna will be within the allowed +2m/-4m tolerance. No other antenna can be installed within 3 meters from the radiating element. Any guy wires that pass within 10 ft. of any radiating element must be replaced with a non-metallic substitute. 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.

An input power level of .185 kW will be necessary at the antenna input in order to reach the required .250 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

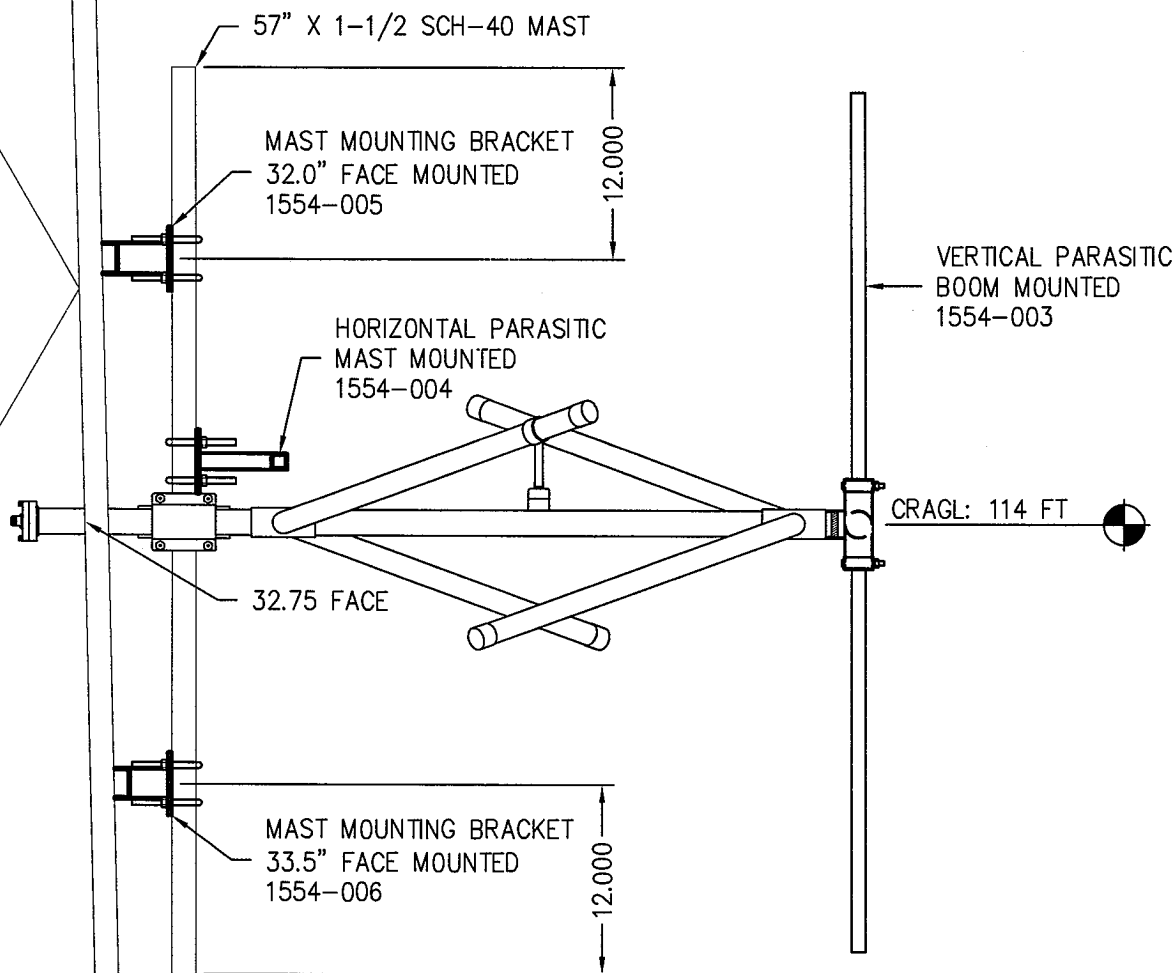
Antenna Model	PSIFML-1A-DA
Type	1-bay directional FM antenna
Frequency	90.1 MHz
Polarization	Circular
Envelope RMS	.671
Composite RMS	.576
Gain (h-pol)	1.35 (1.32 dB)
Gain (v-pol)	1.17 (.701dB)
ERP	.250 kW
Antenna input power	.185 kW
Input	Type "N" female
Power rating	.750 kW
Length	4.75 ft.
Weight	56.5 lbs.
Wind Area	5.43 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.

 4/14/2016

Douglas A. Ross
President
Propagation Systems Inc.



SPECIFICATIONS	
LENGTH:	4.75 FT [1.45 m]
RATING:	.75 kW
GAIN:	1.35 (1.32 dB)
WEIGHT:	56.5 LB [20.87 Kg]
WINDAREA:	5.43 Ft ²
TIA-222-F (NO ICE)	

PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATION AND SPECIFICATIONS

MODEL:	PSIFML-1A-DA	DRAWN BY:	B.K.SCHILLING	DATE:	3/29/16
CHANNEL/ FREQUENCY:	90.1 MHz	APPROVED BY:		DATE:	
SCALE:		DRAWING NO.:	1554-001	REV.	

REV.	MADE BY CHECKED BY	DATE	CHANGE	SIZE
				A

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.



VERTICAL PARASITIC
BOOM MOUNTED
1554-003

300°

MAST MOUNTING BRACKET
FACE MOUNTED
1554-006

MAST MOUNTING BRACKET
FACE MOUNTED
1554-005

HORIZONTAL PARASITIC
MAST MOUNTED
1554-004

BLACK BAND

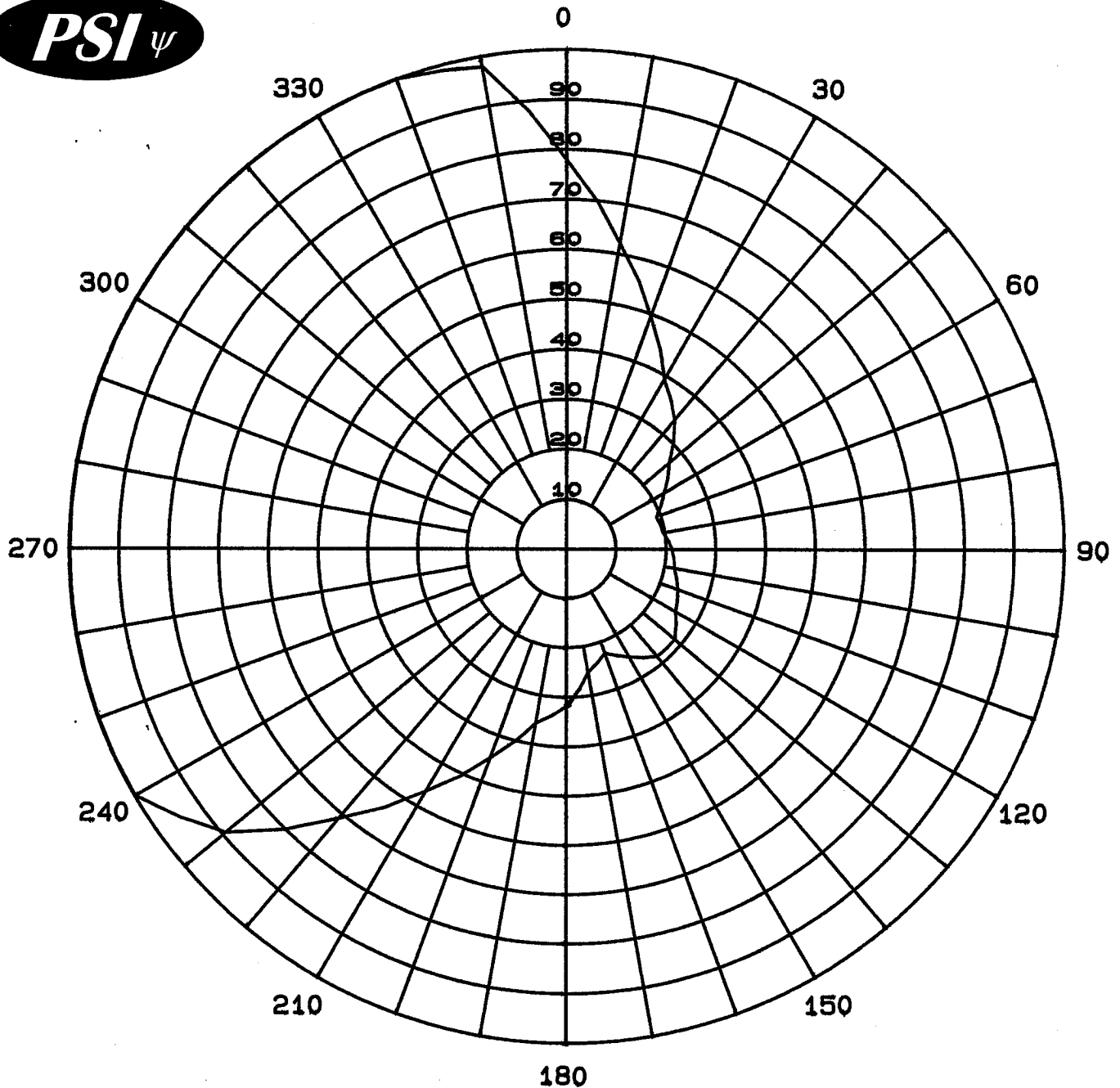
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Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ORIENTATION AND PLAN VIEW

MODEL:	PSIFML-1A-DA	DRAWN BY:	B.K.SCHILLING	DATE:	3/29/16
CHANNEL/ FREQUENCY:	90.1 MHz	APPROVED BY:		DATE:	
SCALE:		DRAWING NO.:	1554-002	REV.	

REV.	MADE BY CHECKED BY	DATE	CHANGE	SIZE
				A
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Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .250 kW (-6.02 dBk)
RMS Envelope: .671
Frequency: 90.1 MHz
WVRS Gore, VA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Maximum Envelope Tabulation

Antenna: PSIFML-1A-DA

Timber Ridge Ministries, Inc.

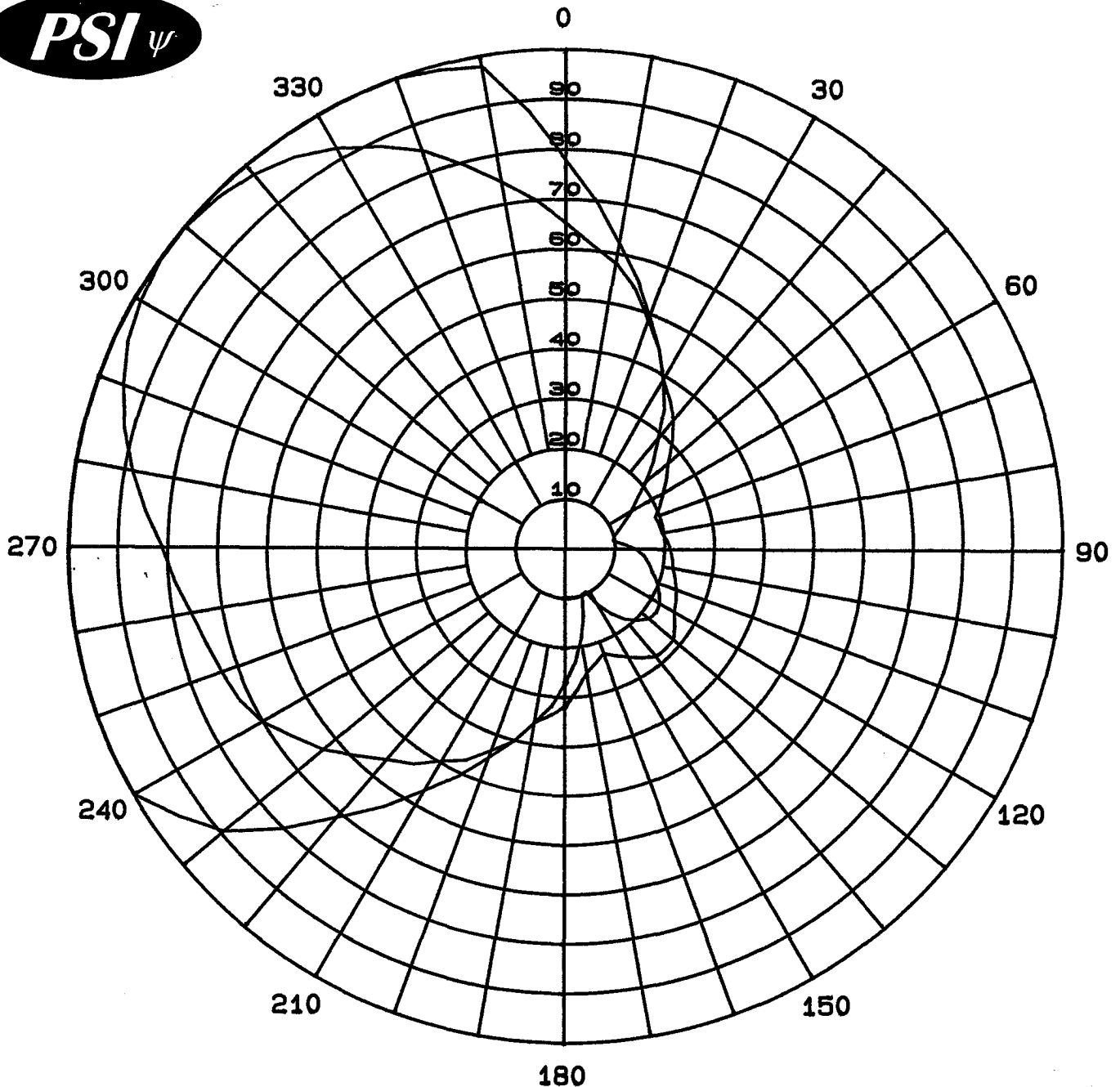
Station: WVRS

Frequency: 90.1 MHz

Location: Gore, VA

Maximum ERP: .250 kW (-6.02 dBk)

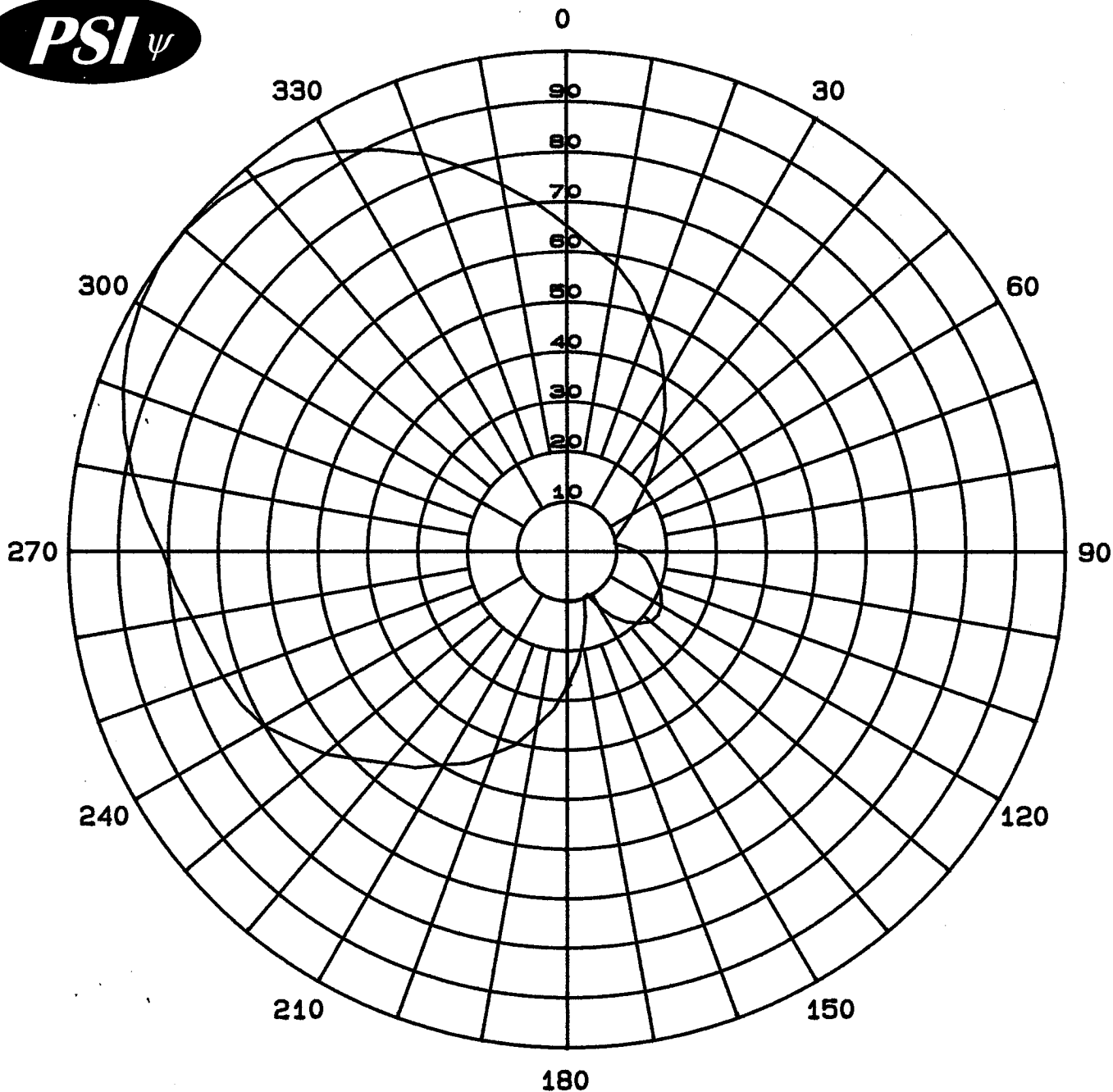
Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.778	0.151	-8.20
10	0.618	0.095	-10.20
20	0.491	0.060	-12.20
30	0.390	0.038	-14.20
40	0.336	0.028	-15.49
50	0.267	0.018	-17.49
60	0.324	0.026	-15.81
70	0.190	0.009	-20.45
80	0.195	0.010	-20.22
90	0.210	0.011	-19.58
100	0.219	0.012	-19.21
110	0.237	0.014	-18.53
120	0.252	0.016	-17.99
130	0.283	0.020	-16.98
140	0.283	0.020	-16.98
150	0.252	0.016	-17.99
160	0.224	0.013	-19.02
170	0.252	0.016	-17.99
180	0.317	0.025	-16.00
190	0.356	0.032	-14.99
200	0.448	0.050	-13.00
210	0.564	0.080	-11.00
220	0.710	0.126	-9.00
230	0.893	0.199	-7.00
240	1.000	0.250	-6.02
250	1.000	0.250	-6.02
260	1.000	0.250	-6.02
270	1.000	0.250	-6.02
280	1.000	0.250	-6.02
290	1.000	0.250	-6.02
300	1.000	0.250	-6.02
310	1.000	0.250	-6.02
320	1.000	0.250	-6.02
330	1.000	0.250	-6.02
340	1.000	0.250	-6.02
350	1.000	0.250	-6.02



Maximum Envelope and
Composite Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .250 kW (-6.02 dBk)
RMS Envelope: .671
RMS Composite: .576
Frequency: 90.1 MHz

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

WVRS Gore, VA



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .250 kW (-6.02 dBk)
RMS Composite: .576
Frequency: 90.1 MHz
WVRS Gore, VA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFML-1A-DA

Timber Ridge Ministries, Inc.

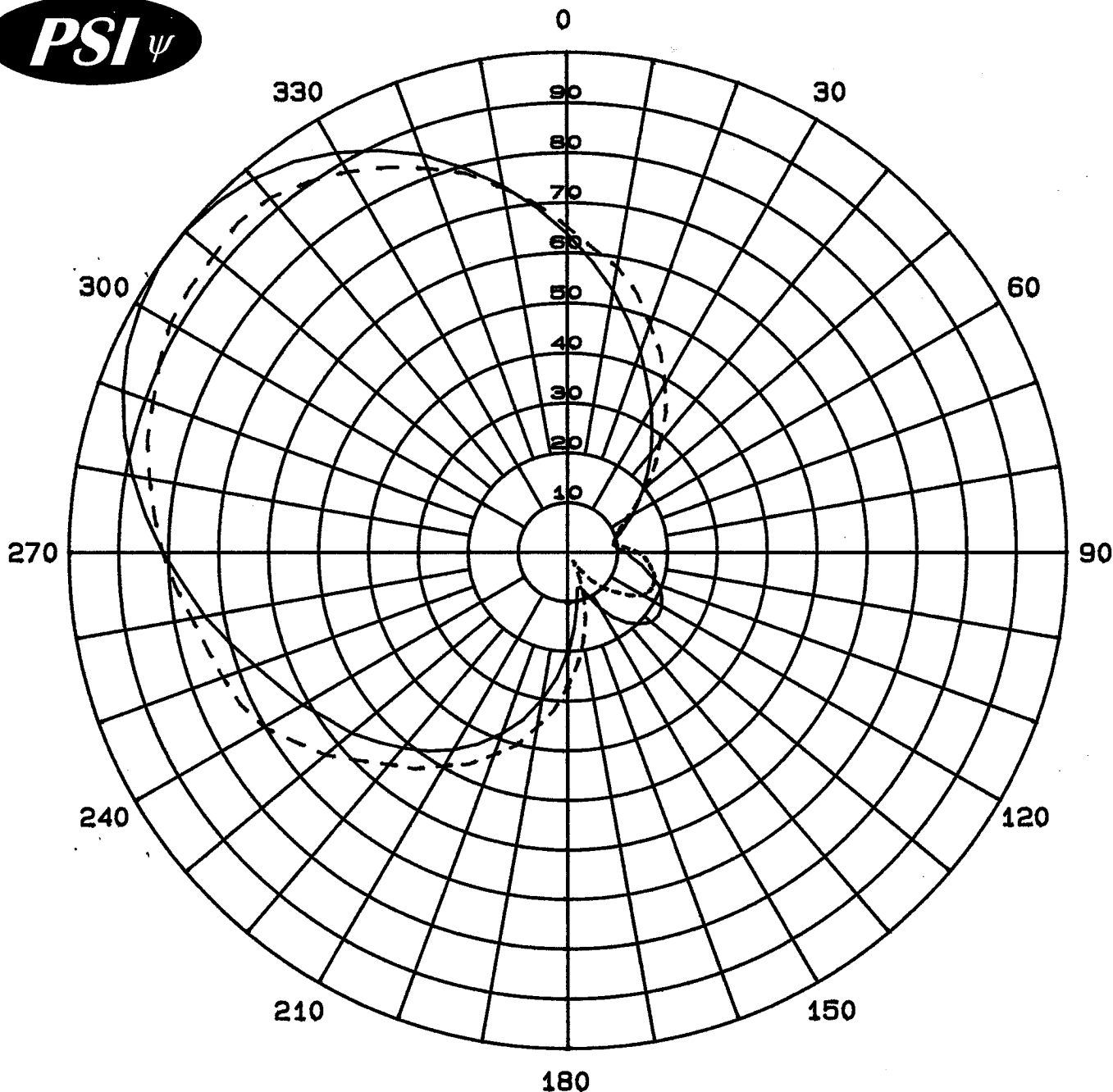
Station: WVRS

Frequency: 90.1 MHz

Location: Gore, VA

Maximum ERP: .250 kW (-6.02 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.652	0.106	-9.74
10	0.579	0.084	-10.77
20	0.484	0.059	-12.32
30	0.389	0.038	-14.22
40	0.288	0.021	-16.83
50	0.209	0.011	-19.62
60	0.150	0.006	-22.50
70	0.111	0.003	-25.11
80	0.095	0.002	-26.47
90	0.140	0.005	-23.10
100	0.169	0.007	-21.46
110	0.195	0.010	-20.22
120	0.218	0.012	-19.25
130	0.219	0.012	-19.21
140	0.185	0.009	-20.68
150	0.130	0.004	-23.74
160	0.097	0.002	-26.29
170	0.183	0.008	-20.77
180	0.270	0.018	-17.39
190	0.356	0.032	-14.99
200	0.433	0.047	-13.29
210	0.496	0.062	-12.11
220	0.557	0.078	-11.10
230	0.634	0.100	-9.98
240	0.702	0.123	-9.09
250	0.735	0.135	-8.69
260	0.764	0.146	-8.36
270	0.811	0.164	-7.84
280	0.885	0.196	-7.08
290	0.948	0.225	-6.48
300	0.988	0.244	-6.13
310	1.000	0.250	-6.02
320	0.976	0.238	-6.23
330	0.924	0.213	-6.71
340	0.847	0.179	-7.46
350	0.745	0.139	-8.58



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
Gain H-pol (solid): 1.35 (1.30 dB)
Gain V-pol (dash): 1.17 (.701 dB)
Frequency: 90.1 MHz
WVRS Gore, VA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFML-1A-DA
 Timber Ridge Ministries, Inc.
 Station: WVRS
 Frequency: 90.1 MHz
 Location: Gore, VA

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.638	0.550	-2.60
10	0.531	0.381	-4.19
20	0.427	0.246	-6.09
30	0.337	0.153	-8.14
40	0.261	0.092	-10.36
50	0.198	0.053	-12.76
60	0.150	0.030	-15.17
70	0.111	0.017	-17.79
80	0.092	0.011	-19.42
90	0.117	0.018	-17.33
100	0.150	0.030	-15.17
110	0.195	0.051	-12.90
120	0.218	0.064	-11.93
130	0.219	0.065	-11.89
140	0.185	0.046	-13.35
150	0.130	0.023	-16.42
160	0.075	0.008	-21.20
170	0.108	0.016	-18.03
180	0.204	0.056	-12.50
190	0.301	0.122	-9.13
200	0.387	0.202	-6.94
210	0.459	0.284	-5.46
220	0.514	0.357	-4.48
230	0.565	0.431	-3.66
240	0.613	0.507	-2.95
250	0.666	0.599	-2.23
260	0.728	0.715	-1.45
270	0.810	0.886	-0.53
280	0.885	1.057	0.24
290	0.948	1.213	0.84
300	0.988	1.318	1.20
310	1.000	1.350	1.30
320	0.976	1.286	1.09
330	0.924	1.153	0.62
340	0.847	0.969	-0.14
350	0.745	0.749	-1.25

Maximum Value

Field 1.00
 Gain 1.35 (1.30 dB)
 Azimuth Bearing 310 degrees

Minimum Field

Field 0.092
 Gain .011 (-19.42 dB)
 Azimuth Bearing 80 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.652	0.574	-2.41
10	0.579	0.453	-3.44
20	0.484	0.316	-5.00
30	0.389	0.204	-6.90
40	0.288	0.112	-9.51
50	0.209	0.059	-12.29
60	0.136	0.025	-16.03
70	0.102	0.014	-18.52
80	0.095	0.012	-19.14
90	0.140	0.026	-15.77
100	0.169	0.039	-14.14
110	0.184	0.046	-13.40
120	0.175	0.041	-13.84
130	0.125	0.021	-16.76
140	0.075	0.008	-21.20
150	0.021	0.001	-32.25
160	0.097	0.013	-18.96
170	0.183	0.045	-13.45
180	0.270	0.098	-10.07
190	0.356	0.171	-7.67
200	0.433	0.253	-5.97
210	0.496	0.332	-4.79
220	0.557	0.419	-3.78
230	0.634	0.543	-2.65
240	0.702	0.665	-1.77
250	0.735	0.729	-1.37
260	0.764	0.788	-1.03
270	0.811	0.888	-0.52
280	0.851	0.978	-0.10
290	0.884	1.055	0.23
300	0.919	1.140	0.57
310	0.925	1.155	0.63
320	0.926	1.158	0.64
330	0.880	1.045	0.19
340	0.818	0.903	-0.44
350	0.740	0.739	-1.31

Maximum Value

Field 0.93
 Gain 1.17 (.701 dB)
 Azimuth Bearing 315 degree

Minimum Field

Field 0.021
 Gain .001 (-32.25 dB)
 Azimuth Bearing 150 degrees

ERP Tabulation

Antenna: PSIFML-1A-DA
Timber Ridge Ministries, Inc.
Station: WVRS

Frequency: 90.1 MHz

Location: Gore, VA

Maximum ERP: .250 kW (-6.02 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.638	0.102	-9.92
10	0.531	0.070	-11.52
20	0.427	0.046	-13.41
30	0.337	0.028	-15.47
40	0.261	0.017	-17.69
50	0.198	0.010	-20.09
60	0.150	0.006	-22.50
70	0.111	0.003	-25.11
80	0.092	0.002	-26.74
90	0.117	0.003	-24.66
100	0.150	0.006	-22.50
110	0.195	0.010	-20.22
120	0.218	0.012	-19.25
130	0.219	0.012	-19.21
140	0.185	0.009	-20.68
150	0.130	0.004	-23.74
160	0.075	0.001	-28.52
170	0.108	0.003	-25.35
180	0.204	0.010	-19.83
190	0.301	0.023	-16.45
200	0.387	0.037	-14.27
210	0.459	0.053	-12.78
220	0.514	0.066	-11.80
230	0.565	0.080	-10.98
240	0.613	0.094	-10.27
250	0.666	0.111	-9.55
260	0.728	0.132	-8.78
270	0.810	0.164	-7.85
280	0.885	0.196	-7.08
290	0.948	0.225	-6.48
300	0.988	0.244	-6.13
310	1.000	0.250	-6.02
320	0.976	0.238	-6.23
330	0.924	0.213	-6.71
340	0.847	0.179	-7.46
350	0.745	0.139	-8.58

Maximum Value (H-pol)

Field 1.00
ERP .250 kW (-6.02 dBk)
Azimuth Bearing 310 degrees

Minimum Field (H-pol)

Field 0.092
ERP .002 kW (-26.74 dBk)
Azimuth Bearing 80 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.652	0.106	-9.74
10	0.579	0.084	-10.77
20	0.484	0.059	-12.32
30	0.389	0.038	-14.22
40	0.288	0.021	-16.83
50	0.209	0.011	-19.62
60	0.136	0.005	-23.35
70	0.102	0.003	-25.85
80	0.095	0.002	-26.47
90	0.140	0.005	-23.10
100	0.169	0.007	-21.46
110	0.184	0.008	-20.72
120	0.175	0.008	-21.16
130	0.125	0.004	-24.08
140	0.075	0.001	-28.52
150	0.021	0.000	-39.58
160	0.097	0.002	-26.29
170	0.183	0.008	-20.77
180	0.270	0.018	-17.39
190	0.356	0.032	-14.99
200	0.433	0.047	-13.29
210	0.496	0.062	-12.11
220	0.557	0.078	-11.10
230	0.634	0.100	-9.98
240	0.702	0.123	-9.09
250	0.735	0.135	-8.69
260	0.764	0.146	-8.36
270	0.811	0.164	-7.84
280	0.851	0.181	-7.42
290	0.884	0.195	-7.09
300	0.919	0.211	-6.75
310	0.925	0.214	-6.70
320	0.926	0.214	-6.69
330	0.880	0.194	-7.13
340	0.818	0.167	-7.77
350	0.740	0.137	-8.64

Maximum Value (V-pol)

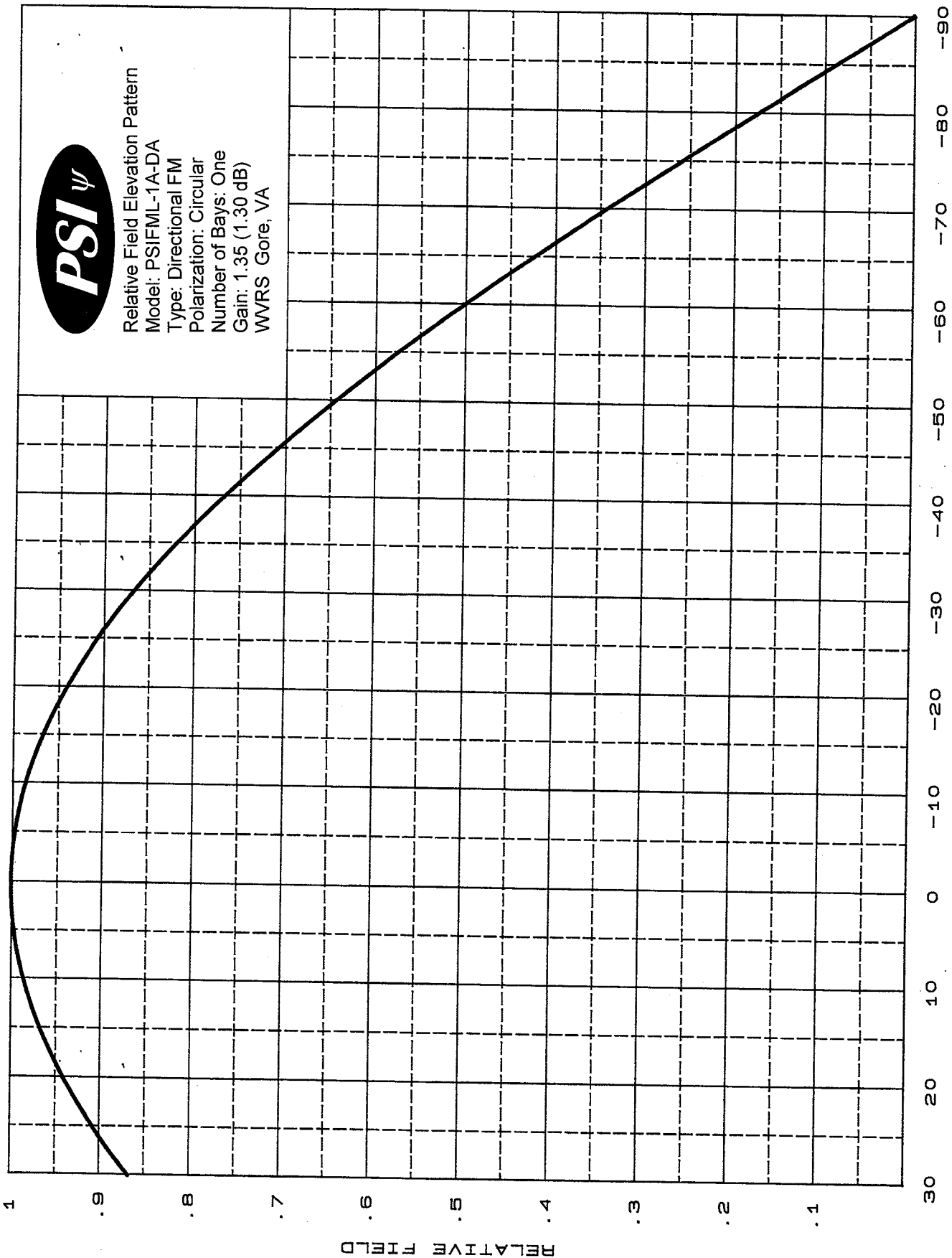
Field 0.93
ERP .218 kW (-6.62 dBk)
Azimuth Bearing 315 degree

Minimum Field (V-pol)

Field 0.021
ERP .0001 kW (-39.58 dBk)
Azimuth Bearing 150 degrees



Relative Field Elevation Pattern
Model: PSIFML-1A-DA
Type: Directional FM
Polarization: Circular
Number of Bays: One
Gain: 1.35 (1.30 dB)
WVRS Gore, VA



DEGREES BELOW HORIZONTAL