



# Propagation Systems, Inc.

Quality Broadcast Antenna Systems

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**Directional FM Antenna  
Way Media, Inc.  
KXWA  
Centennial, CO**

A standard model PSIFML antenna was used in conjunction with the customer's 4-5/8" diameter support mast to create the necessary directional radiation pattern. The final antenna consists of a single radiating element, three vertical and two horizontal parasitic elements secured with custom mounts.

Pattern testing was performed using a 1/3 scale model element and mast. 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 mast 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 305.7 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 90.5% of the envelope RMS.

The antenna is to be mounted with the center of radiation at 15 meters (49.2 ft.) above ground level on a customer supplied support mast. At this elevation the antenna will be within the allowed +2m/-4m tolerance from the approved height above ground level. No other antenna can be installed within 10 ft of any radiating element. The antenna is to be positioned 130° 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 .391 kW will be required at the antenna input in order to reach the licensed .5 kW ERP. The transmitter output power requirements are dependent upon the transmission line size and length used to feed the antenna.

### **Antenna Specifications**

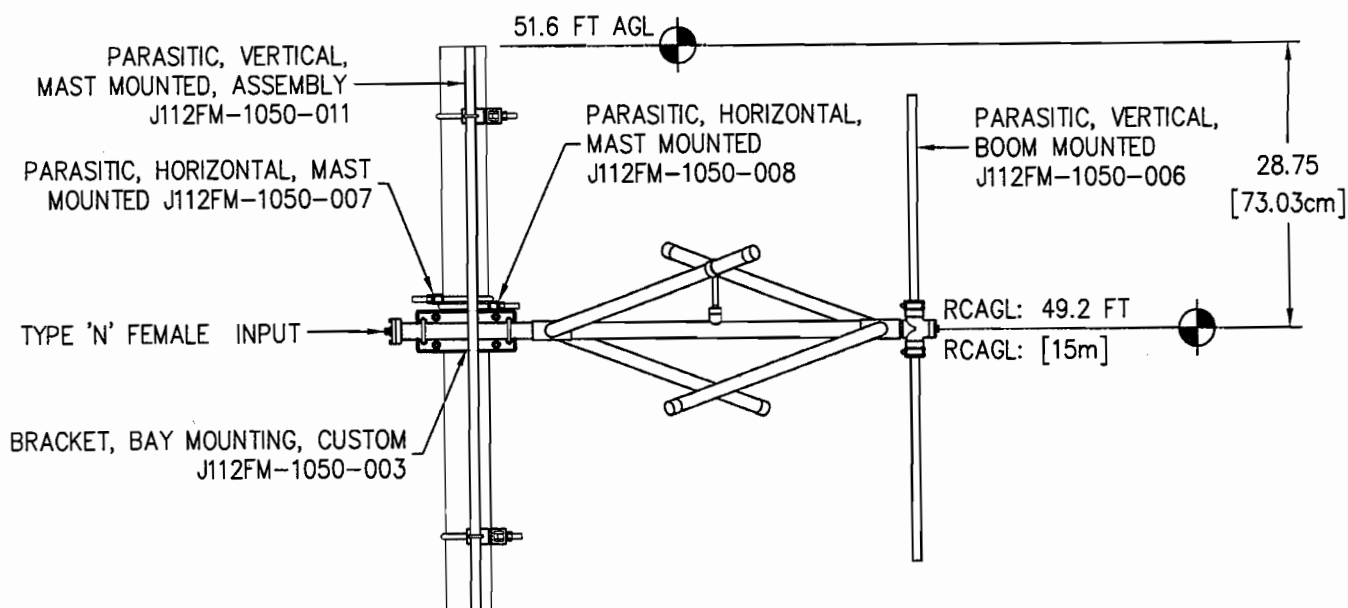
Antenna Model	PSIFML-1A-DA
Type	1-bay directional FM antenna
Frequency	101.9 MHz
Polarization	Circular
Envelope RMS	.673
Composite RMS	.609
Gain (h-pol)	1.28 (1.07 dB)
Gain (V-pol)	1.13 (.53 dB)
Antenna input power	.391 kW
Input	Type "N" female
Power rating	.750 kW
Length	4.8 ft.
Weight	47.5 lbs.
Wind Area	7.6 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.



4.674" O.D. (4.0" I.D.)  
VERTICAL MAST (NOT BY PSI)

ANTENNA SPECIFICATIONS
INPUT: TYPE 'N' FEMALE
RATING: 750 WATTS
GAIN: 1.28 (1.07 dB)
WEIGHT: 47.5 Lb [21.6 Kg]
WINDAREA: 7.6 FT <sup>2</sup>
TIA-222-F (NO ICE)

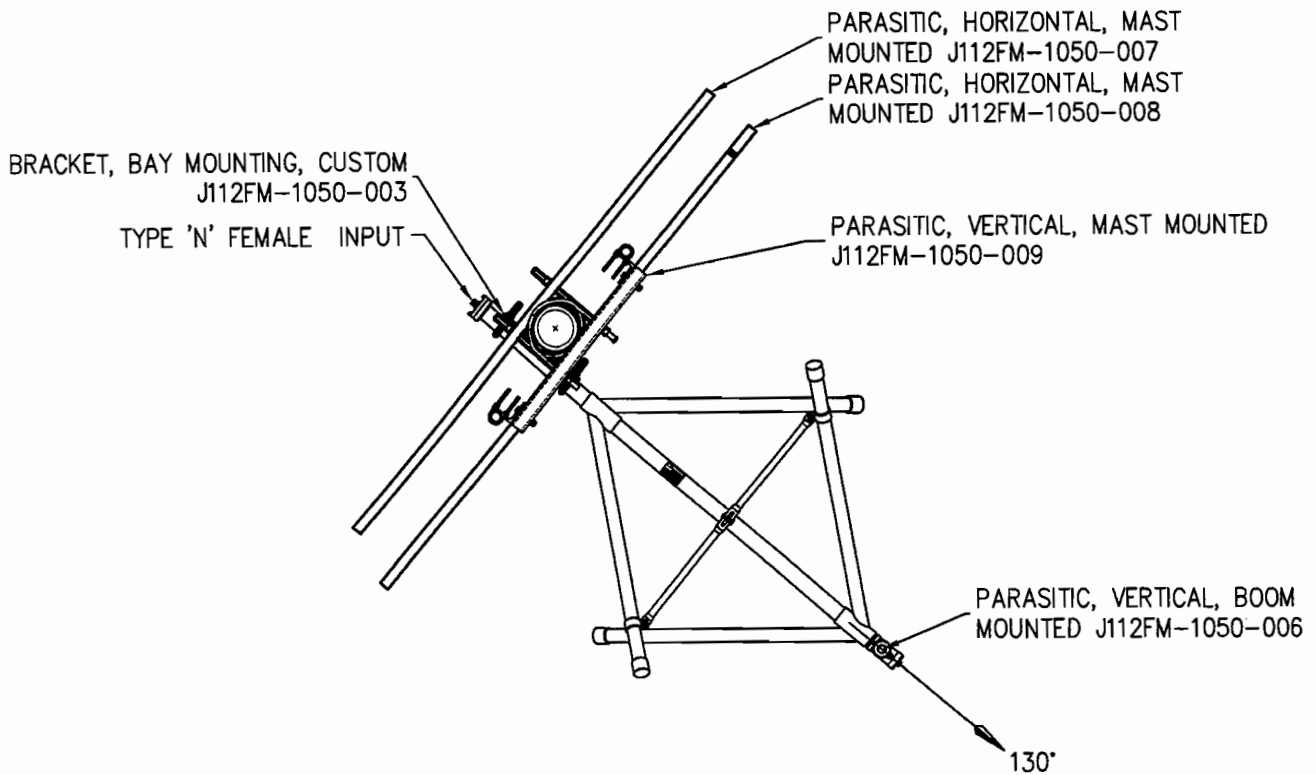
REV.	MADE BY CHECKED BY	DATE	CHANGE
This drawing is loaned subject to the express understanding and agreement that the drawing and information therein contained are, and shall remain the property of PSI, and will not be otherwise utilized or disposed of, directly or indirectly, and will not be used in 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.**

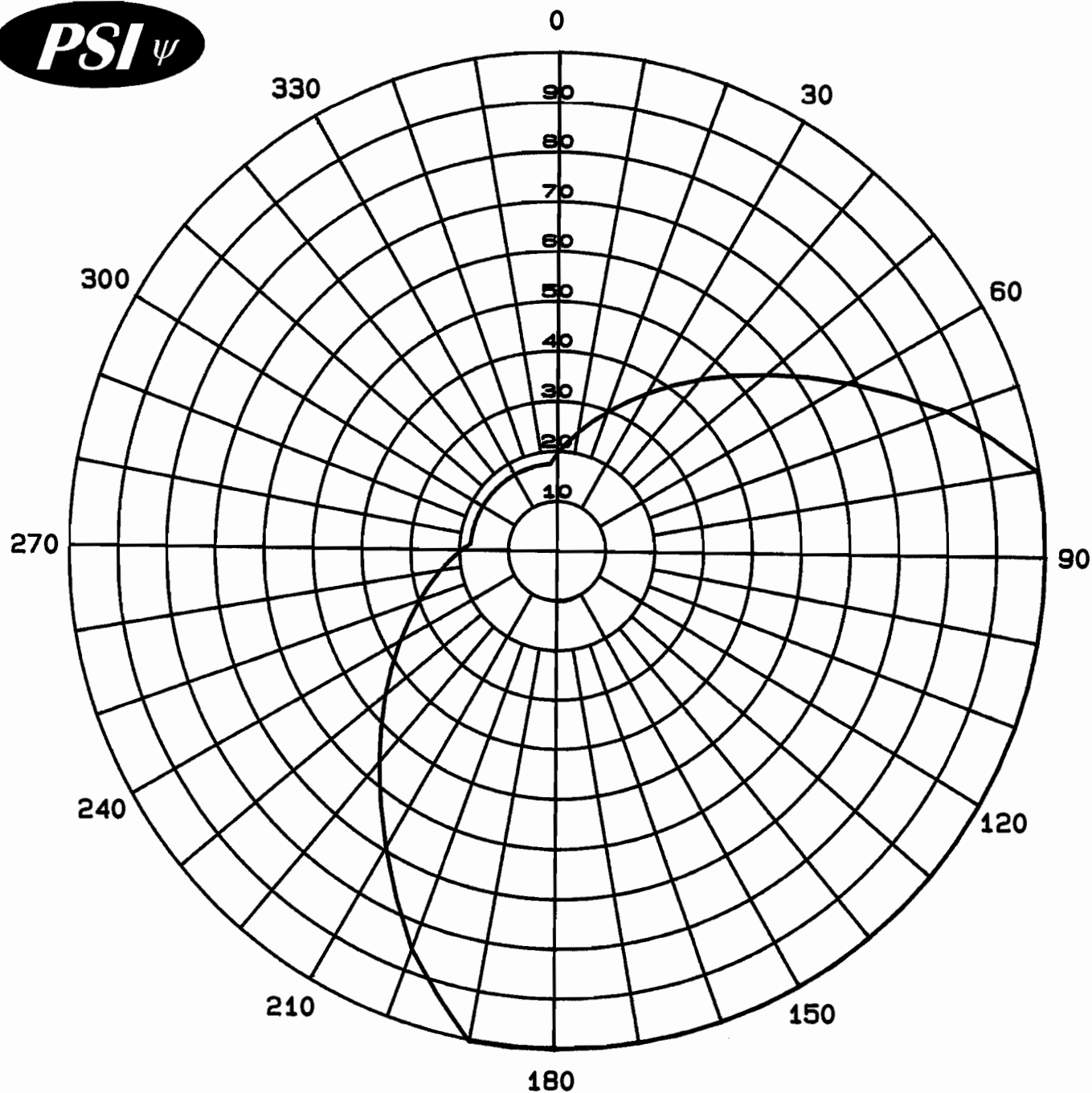
Ebensburg, Pennsylvania USA 814-472-5540

## **ANTENNA ELEVATIONS AND SPECIFICATIONS**

MODEL: PSIFML-1A-DA	DRAWN BY: D.G. Kellar	DATE: 1/09/12
CHANNEL/FREQUENCY: 101.9 MHz	APPROVED BY:	DATE:
SCALE: 1:20	DRAWING NO.: J112FM-1050-001	REV.



				<b>PROPAGATION SYSTEMS, INC.</b>			
				Ebensburg, Pennsylvania USA 814-472-5540			
				PLAN VIEW AND ORIENTATION			
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 foregoing agreement.				SIZE  A		MODEL: PSIFML-1A-DA CHANNEL/FREQUENCY: 101.9 MHz SCALE: 1:20	
				DRAWN BY: D.G. Kellar APPROVED BY: DRAWING NO.: J112FM-1050-002		DATE: 1/09/12 REV.	



Maximum Envelope  
Azimuth Plane Pattern  
Antenna: PSIFML-1A-DA  
Type: 1-Bay Directional FM Antenna  
ERP: .5 kW (-3.01 dBk)  
RMS Envelope: .673  
Frequency: 101.9 MHz  
KXWA Centennial, CO

**Propagation Systems Inc.**  
**PO Box 113**  
**Ebensburg, PA 15931**

## Maximum Envelope Tabulation

Antenna: PSIFML-1A-DA

Way Media, Inc.

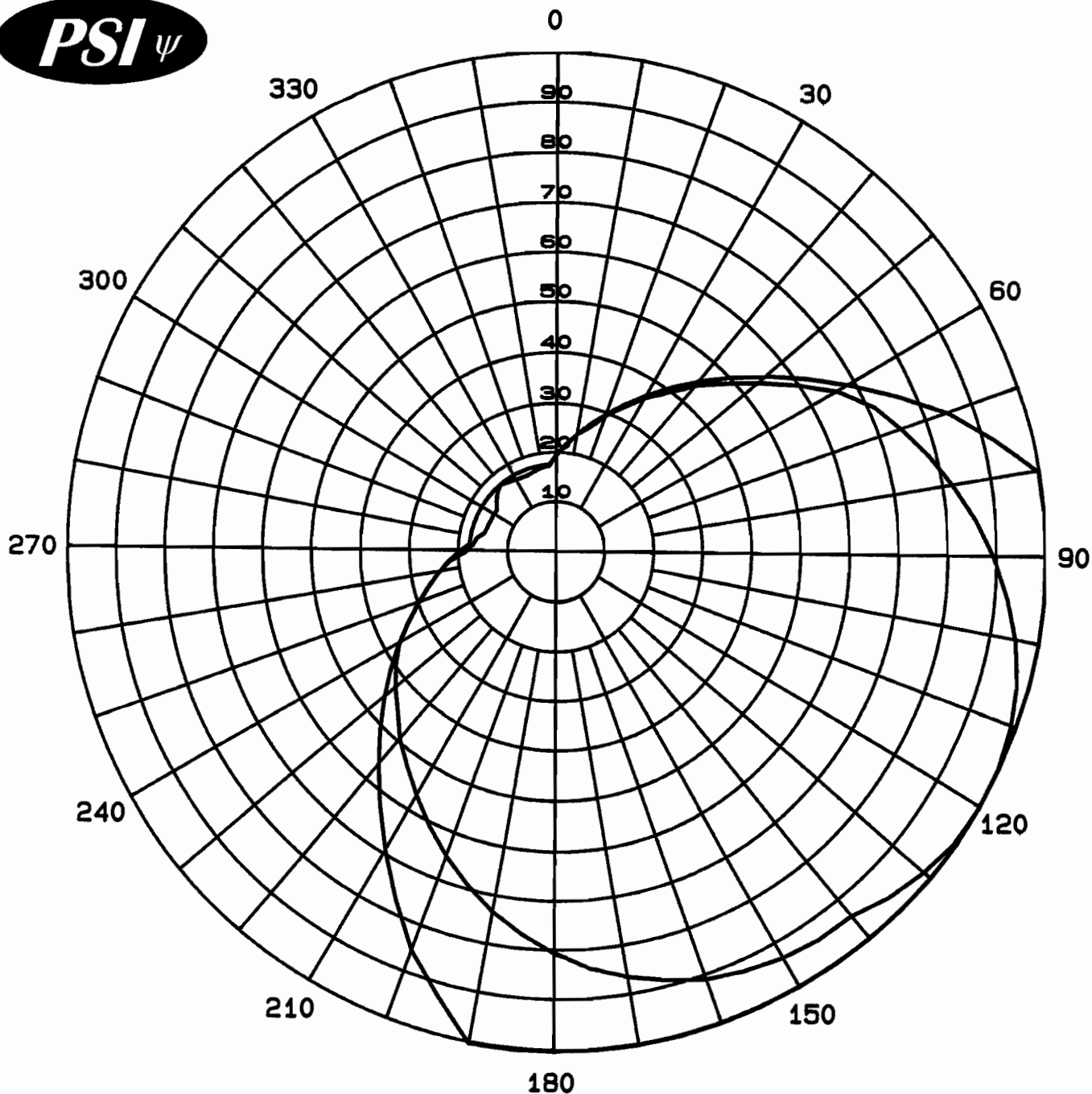
Station: KXWA

Frequency: 101.9 MHz

Location: Centennial, CO

Maximum ERP: .5 kW (-3.01 dBk)

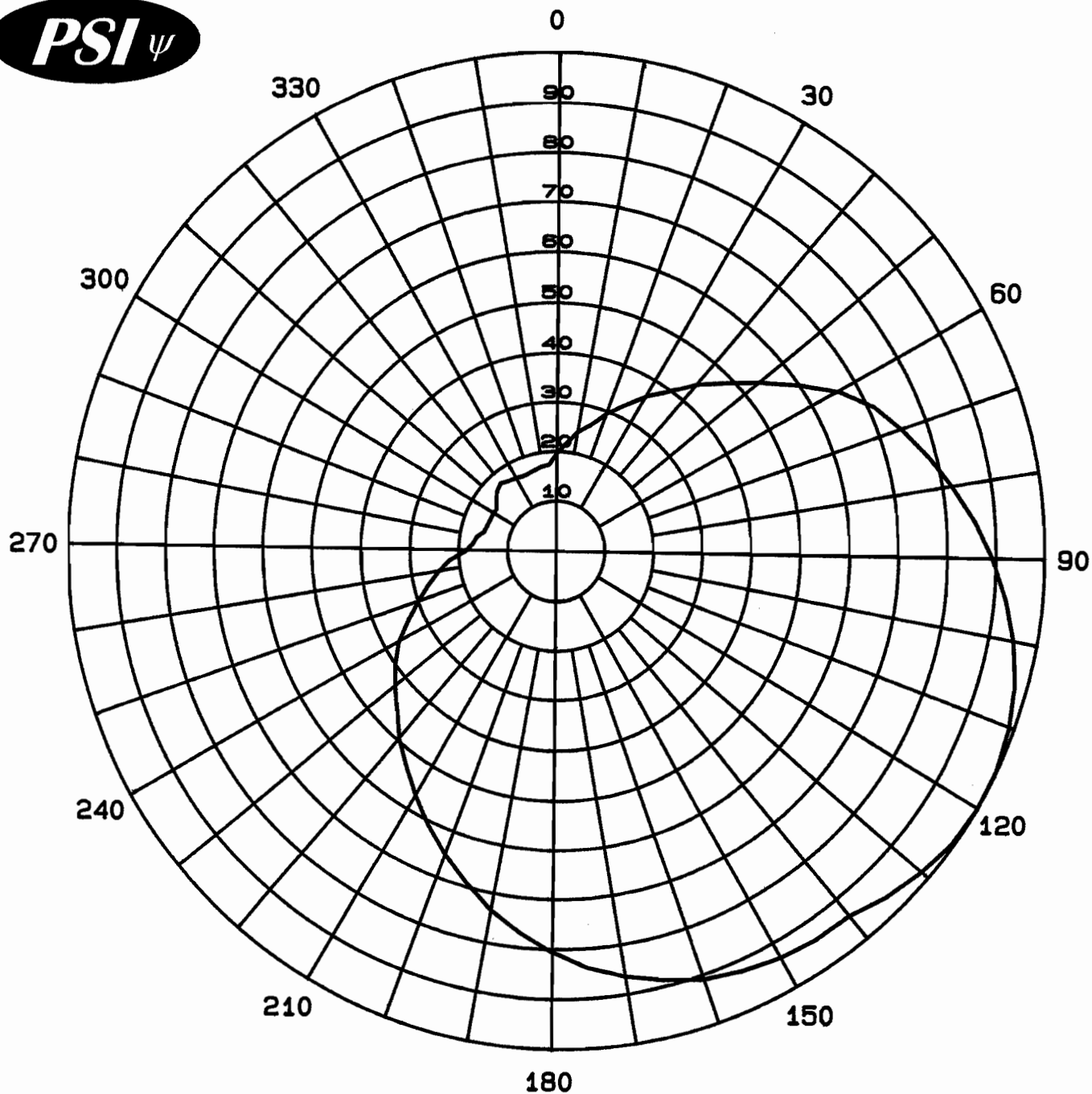
Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.199	0.020	-17.03
10	0.245	0.030	-15.23
20	0.301	0.045	-13.44
30	0.371	0.069	-11.62
40	0.457	0.104	-9.81
50	0.562	0.158	-8.02
60	0.691	0.239	-6.22
70	0.851	0.362	-4.41
80	0.999	0.499	-3.02
90	1.000	0.500	-3.01
100	1.000	0.500	-3.01
110	1.000	0.500	-3.01
120	1.000	0.500	-3.01
130	1.000	0.500	-3.01
140	1.000	0.500	-3.01
150	1.000	0.500	-3.01
160	1.000	0.500	-3.01
170	1.000	0.500	-3.01
180	1.000	0.500	-3.01
190	1.000	0.500	-3.01
200	0.851	0.362	-4.41
210	0.691	0.239	-6.22
220	0.562	0.158	-8.02
230	0.457	0.104	-9.81
240	0.371	0.069	-11.62
250	0.301	0.045	-13.44
260	0.245	0.030	-15.23
270	0.199	0.020	-17.03
280	0.178	0.016	-18.00
290	0.178	0.016	-18.00
300	0.178	0.016	-18.00
310	0.178	0.016	-18.00
320	0.178	0.016	-18.00
330	0.178	0.016	-18.00
340	0.178	0.016	-18.00
350	0.178	0.016	-18.00



Maximum Envelope and  
Composite Pattern  
Antenna: PSIFML-1A-DA  
Type: 1-Bay Directional FM Antenna  
ERP: .5 kW (-3.01 dBk)  
RMS Envelope: .673  
RMS Composite: .609  
Frequency: 101.9 MHz

**Propagation Systems Inc.**  
**PO Box 113**  
**Ebensburg, PA 15931**

KXWA Centennial, CO



Measured Composite  
Azimuth Plane Pattern  
Antenna: PSIFML-1A-DA  
Type: 1-Bay Directional FM Antenna  
ERP: .5 kW (-3.01 dBk)  
RMS Composite: .609  
Frequency: 101.9 MHz  
KXWA Centennial, CO

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## Composite Pattern Tabulation

Antenna: PSIFML-1A-DA

Way Media, Inc.

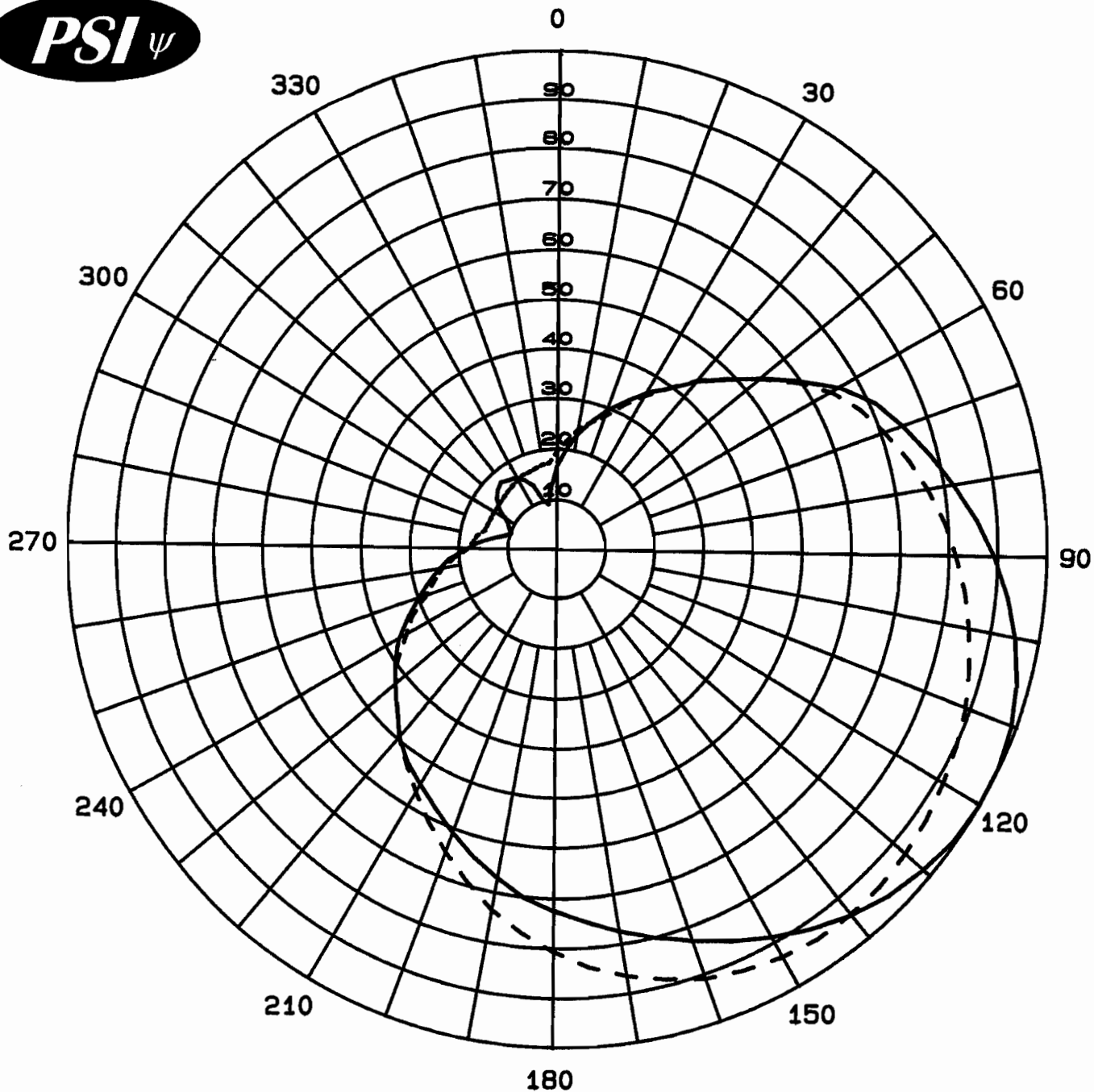
Station: KXWA

Frequency: 101.9 MHz

Location: Centennial, CO

Maximum ERP: .5 kW (-3.01 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.198	0.020	-17.08
10	0.245	0.030	-15.23
20	0.298	0.044	-13.53
30	0.365	0.067	-11.76
40	0.447	0.100	-10.00
50	0.543	0.147	-8.31
60	0.665	0.221	-6.55
70	0.750	0.281	-5.51
80	0.822	0.338	-4.71
90	0.893	0.399	-3.99
100	0.952	0.453	-3.44
110	0.990	0.490	-3.10
120	1.000	0.500	-3.01
130	0.981	0.481	-3.18
140	0.941	0.443	-3.54
150	0.932	0.434	-3.62
160	0.908	0.412	-3.85
170	0.863	0.372	-4.29
180	0.803	0.322	-4.92
190	0.730	0.266	-5.74
200	0.646	0.209	-6.81
210	0.564	0.159	-7.98
220	0.493	0.122	-9.15
230	0.427	0.091	-10.40
240	0.370	0.068	-11.65
250	0.300	0.045	-13.47
260	0.245	0.030	-15.23
270	0.185	0.017	-17.67
280	0.165	0.014	-18.66
290	0.150	0.011	-19.49
300	0.149	0.011	-19.55
310	0.160	0.013	-18.93
320	0.178	0.016	-18.00
330	0.169	0.014	-18.45
340	0.167	0.014	-18.56
350	0.174	0.015	-18.20



Measured Relative Field  
Azimuth Plane Pattern  
Antenna: PSIFML-1A-DA  
Type: 1-Bay Directional FM Antenna  
Gain H-pol (solid): 1.28 (1.07 dB)  
Gain V-pol (dash): 1.13 (.53 dB)  
Frequency: 101.9 MHz  
KXWA Centennial, CO

**Propagation Systems Inc.**  
**PO Box 113**  
**Ebensburg, PA 15931**

## Measured Relative Field Tabulation

Antenna: PSIFML-1A-DA

Way Media, Inc.

Station: KXWA

Frequency: 101.9 MHz

Location: Centennial, CO

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.168	0.036	-14.42
10	0.235	0.071	-11.51
20	0.298	0.114	-9.44
30	0.365	0.171	-7.68
40	0.445	0.253	-5.96
50	0.543	0.377	-4.23
60	0.665	0.566	-2.47
70	0.750	0.720	-1.43
80	0.822	0.865	-0.63
90	0.893	1.021	0.09
100	0.952	1.160	0.64
110	0.990	1.255	0.98
120	1.000	1.280	1.07
130	0.981	1.232	0.91
140	0.941	1.133	0.54
150	0.886	1.005	0.02
160	0.827	0.875	-0.58
170	0.772	0.763	-1.18
180	0.721	0.665	-1.77
190	0.667	0.569	-2.45
200	0.605	0.469	-3.29
210	0.546	0.382	-4.18
220	0.493	0.311	-5.07
230	0.427	0.233	-6.32
240	0.370	0.175	-7.56
250	0.300	0.115	-9.39
260	0.245	0.077	-11.14
270	0.185	0.044	-13.58
280	0.134	0.023	-16.39
290	0.098	0.012	-19.10
300	0.115	0.017	-17.71
310	0.160	0.033	-14.85
320	0.178	0.041	-13.92
330	0.169	0.037	-14.37
340	0.139	0.025	-16.07
350	0.095	0.012	-19.37

Maximum Value

Field 1.00  
Gain 1.28 (1.07 dB)

Azimuth Bearing 120 degrees

Minimum Field

Field 0.095  
Gain .012 (-19.37 dB)

Azimuth Bearing 350 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.198	0.050	-12.99
10	0.245	0.077	-11.14
20	0.285	0.104	-9.83
30	0.358	0.164	-7.85
40	0.447	0.256	-5.92
50	0.542	0.376	-4.25
60	0.646	0.534	-2.72
70	0.711	0.647	-1.89
80	0.768	0.755	-1.22
90	0.815	0.850	-0.70
100	0.856	0.938	-0.28
110	0.891	1.016	0.07
120	0.914	1.069	0.29
130	0.933	1.114	0.47
140	0.940	1.131	0.53
150	0.932	1.112	0.46
160	0.908	1.055	0.23
170	0.863	0.953	-0.21
180	0.803	0.825	-0.83
190	0.730	0.682	-1.66
200	0.646	0.534	-2.72
210	0.564	0.407	-3.90
220	0.493	0.311	-5.07
230	0.426	0.232	-6.34
240	0.353	0.159	-7.97
250	0.284	0.103	-9.86
260	0.238	0.073	-11.40
270	0.183	0.043	-13.68
280	0.165	0.035	-14.58
290	0.150	0.029	-15.41
300	0.149	0.028	-15.46
310	0.150	0.029	-15.41
320	0.155	0.031	-15.12
330	0.162	0.034	-14.74
340	0.167	0.036	-14.47
350	0.174	0.039	-14.12

Maximum Value

Field 0.94  
Gain 1.13 (.53 dB)

Azimuth Bearing 140 degrees

Minimum Field

Field 0.149  
Gain .028 (-15.46 dB)

Azimuth Bearing 300 degrees

## ERP Tabulation

Antenna: PSIFML-1A-DA

Way Media, Inc.

Station: KXWA

Frequency: 101.9 MHz

Location: Centennial, CO

Maximum ERP: .5 kW (-3.01 dBk)

### Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.168	0.014	-18.50
10	0.235	0.028	-15.59
20	0.298	0.044	-13.53
30	0.365	0.067	-11.76
40	0.445	0.099	-10.04
50	0.543	0.147	-8.31
60	0.665	0.221	-6.55
70	0.750	0.281	-5.51
80	0.822	0.338	-4.71
90	0.893	0.399	-3.99
100	0.952	0.453	-3.44
110	0.990	0.490	-3.10
120	1.000	0.500	-3.01
130	0.981	0.481	-3.18
140	0.941	0.443	-3.54
150	0.886	0.392	-4.06
160	0.827	0.342	-4.66
170	0.772	0.298	-5.26
180	0.721	0.260	-5.85
190	0.667	0.222	-6.53
200	0.605	0.183	-7.38
210	0.546	0.149	-8.27
220	0.493	0.122	-9.15
230	0.427	0.091	-10.40
240	0.370	0.068	-11.65
250	0.300	0.045	-13.47
260	0.245	0.030	-15.23
270	0.185	0.017	-17.67
280	0.134	0.009	-20.47
290	0.098	0.005	-23.19
300	0.115	0.007	-21.80
310	0.160	0.013	-18.93
320	0.178	0.016	-18.00
330	0.169	0.014	-18.45
340	0.139	0.010	-20.15
350	0.095	0.005	-23.46

#### Maximum Value (H-pol)

Field 1.00  
ERP .5 kW (-3.01 dBk)

Azimuth Bearing 120 degrees

#### Minimum Field (H-pol)

Field 0.095  
ERP .005 kW (-23.46 dBk)

Azimuth Bearing 350 degrees

### Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.198	0.020	-17.08
10	0.245	0.030	-15.23
20	0.285	0.041	-13.91
30	0.358	0.064	-11.93
40	0.447	0.100	-10.00
50	0.542	0.147	-8.33
60	0.646	0.209	-6.81
70	0.711	0.253	-5.97
80	0.768	0.295	-5.30
90	0.815	0.332	-4.79
100	0.856	0.366	-4.36
110	0.891	0.397	-4.01
120	0.914	0.418	-3.79
130	0.933	0.435	-3.61
140	0.940	0.442	-3.55
150	0.932	0.434	-3.62
160	0.908	0.412	-3.85
170	0.863	0.372	-4.29
180	0.803	0.322	-4.92
190	0.730	0.266	-5.74
200	0.646	0.209	-6.81
210	0.564	0.159	-7.98
220	0.493	0.122	-9.15
230	0.426	0.091	-10.42
240	0.353	0.062	-12.05
250	0.284	0.040	-13.94
260	0.238	0.028	-15.48
270	0.183	0.017	-17.76
280	0.165	0.014	-18.66
290	0.150	0.011	-19.49
300	0.149	0.011	-19.55
310	0.150	0.011	-19.49
320	0.155	0.012	-19.20
330	0.162	0.013	-18.82
340	0.167	0.014	-18.56
350	0.174	0.015	-18.20

#### Maximum Value (V-pol)

Field 0.94  
ERP .442 kW (-3.55 dBk)

Azimuth Bearing 140 degrees

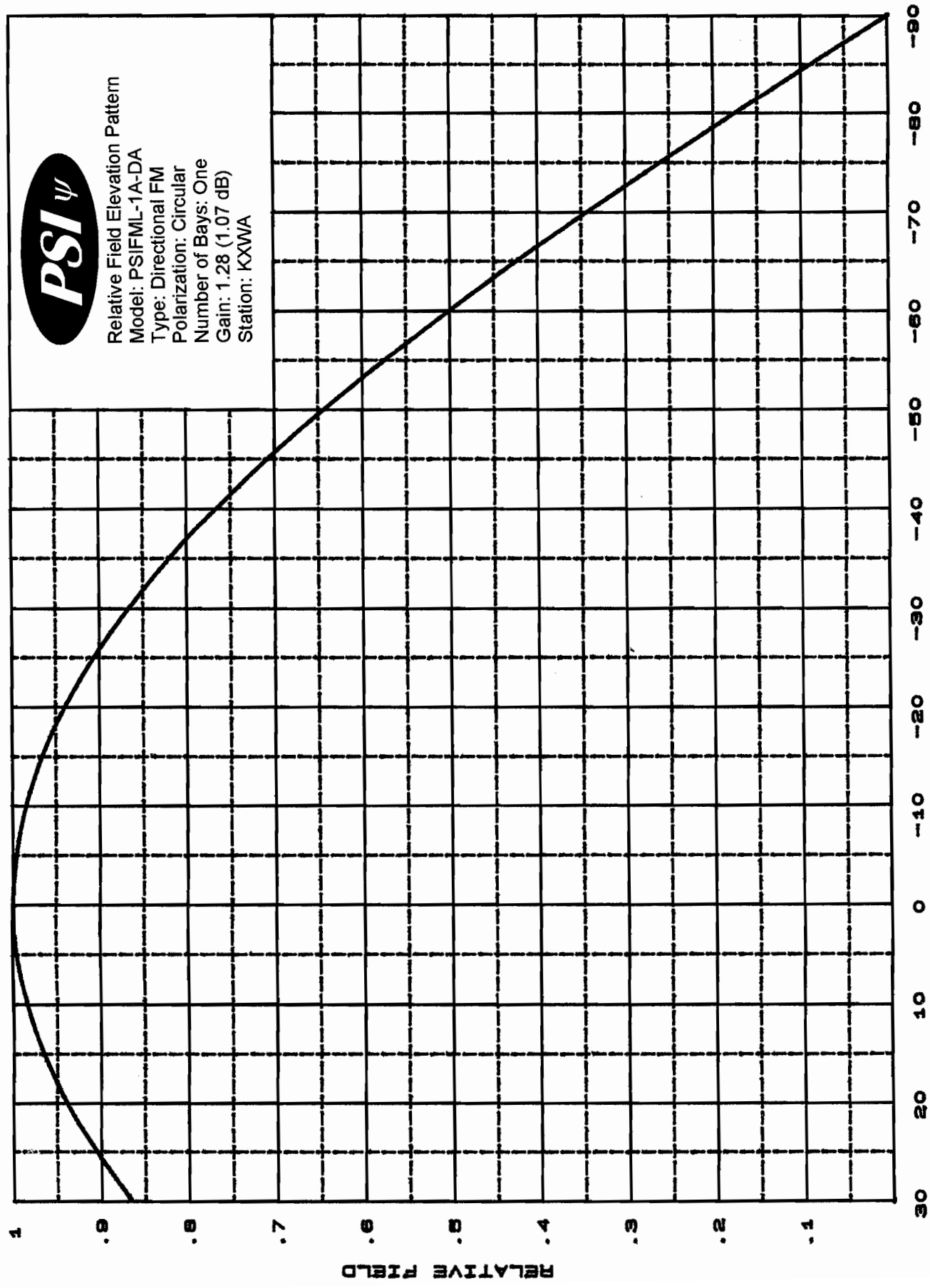
#### Minimum Field (V-pol)

Field 0.149  
ERP .011 kW (-19.55 dBk)

Azimuth Bearing 300 degrees



Relative Field Elevation Pattern  
Model: PSIFML-1A-DA  
Type: Directional FM  
Polarization: Circular  
Number of Bays: One  
Gain: 1.28 (1.07 dB)  
Station: KXWA



DEGREES BELOW HORIZONTAL