



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
KOMQ
Spokane Public Radio
Omak, WA**

A standard model PSIFML antenna with parasitic elements and radome was used in conjunction with the customer's Rohn 25G triangular tower to create the necessary directional radiation pattern. The final antenna consists of one radiating element secured to the tower face with a custom support mast. The antenna also includes a vertical and horizontal parasitic element. 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 8753A-network analyzer operating at 265.5 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 87.4% of the envelope RMS.

The antenna is to be mounted 8.1 meters (26.6 ft) above ground level on the southwest tower face and positioned 242° 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 25 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 .169 kW will be necessary at the antenna input in order to reach the required .100 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 with radome
Frequency	88.5 MHz
Polarization	Circular
Envelope RMS	.883
Composite RMS	.772
Gain (h-pol)	.59 (-2.29 dB)
Gain (v-pol)	.59 (-2.29 dB)
ERP	.100 kW
Antenna input power	.169 kW
Input	Type "N" female
Power rating	.750 kW
Length	8 ft.
Weight	80.2 lbs.
Wind Area	6.94 sq. ft.

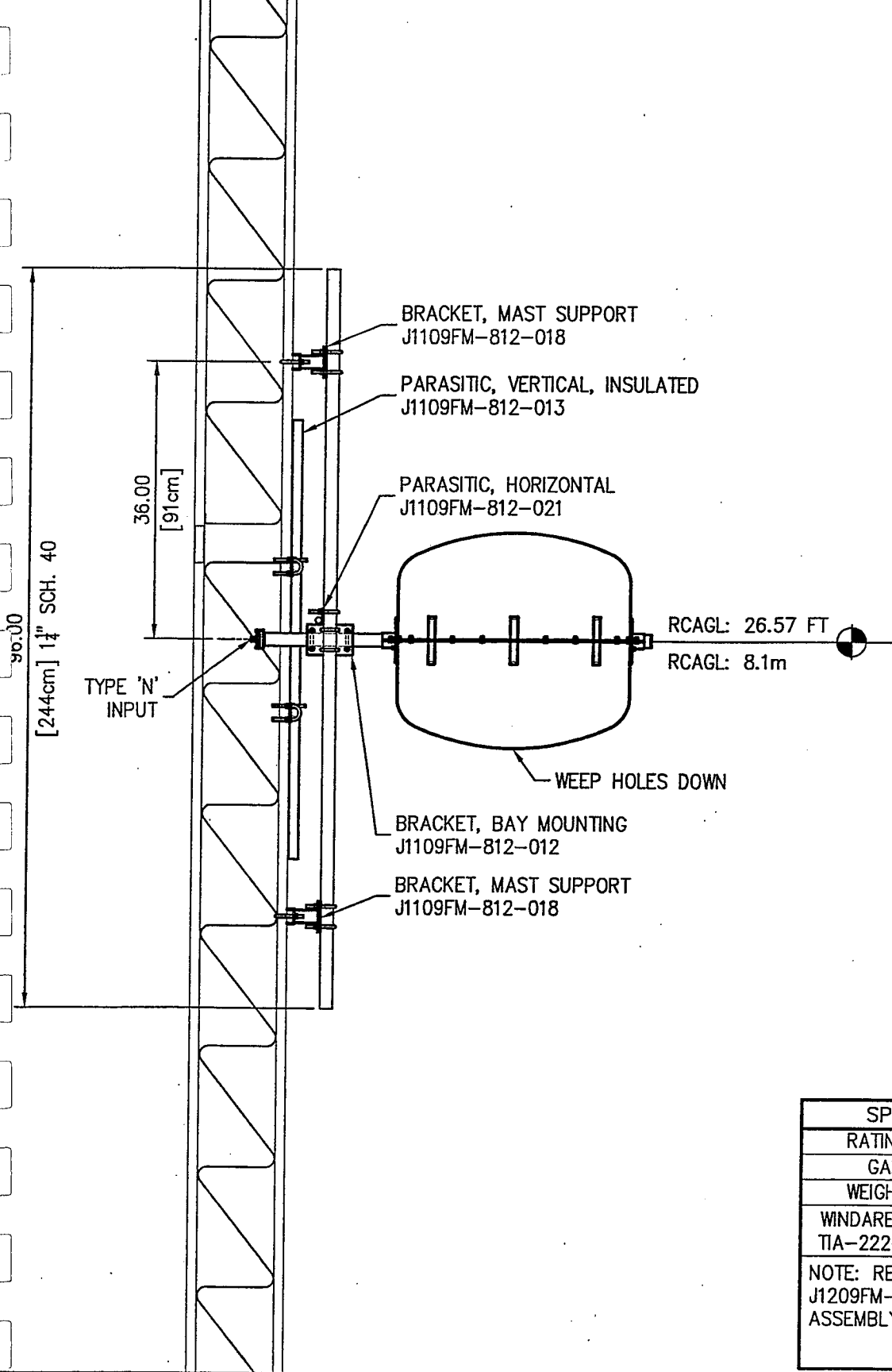
Statement of Certification

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.



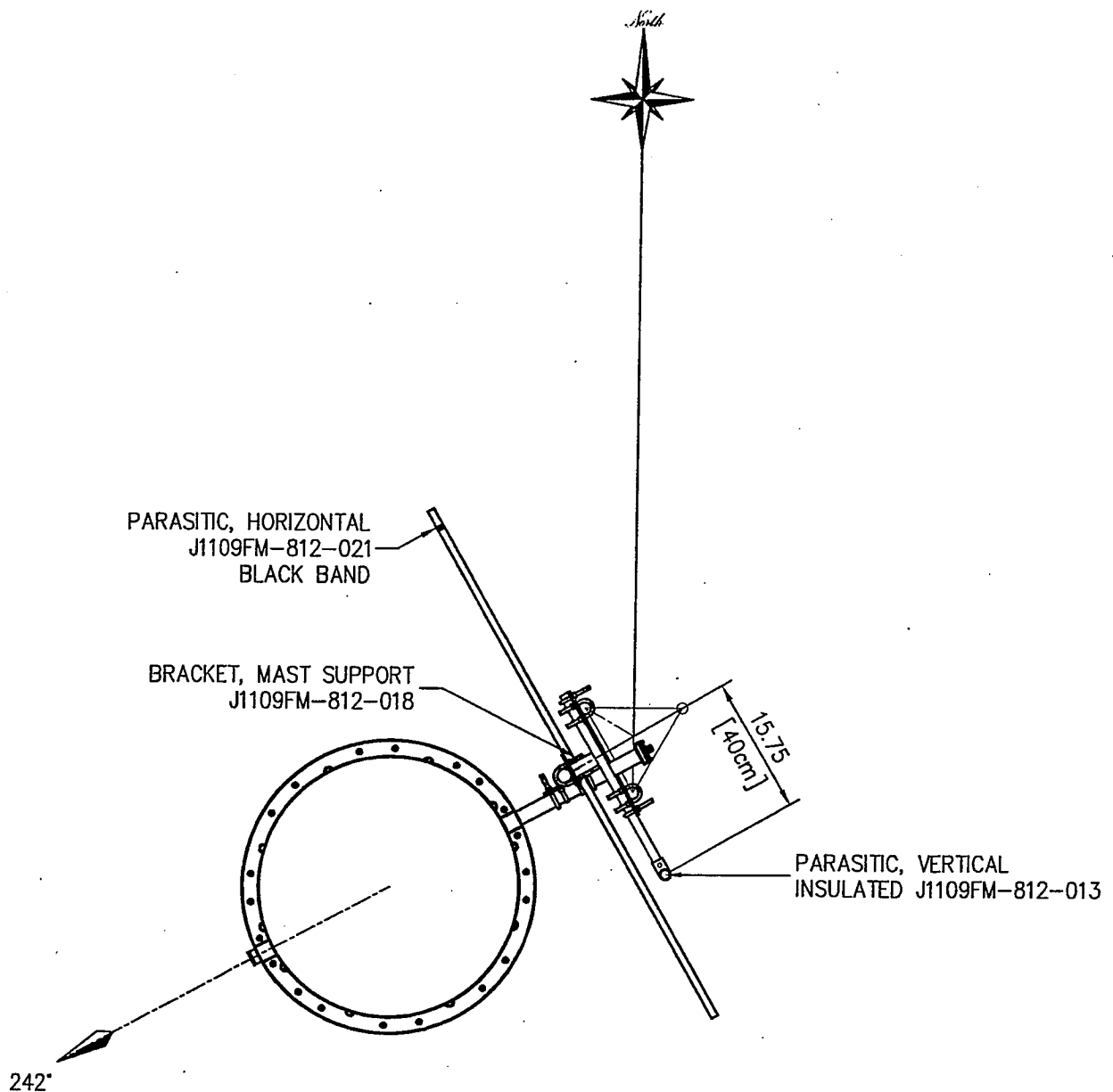
5/27/2010

Douglas A. Ross
President
Propagation Systems Inc.

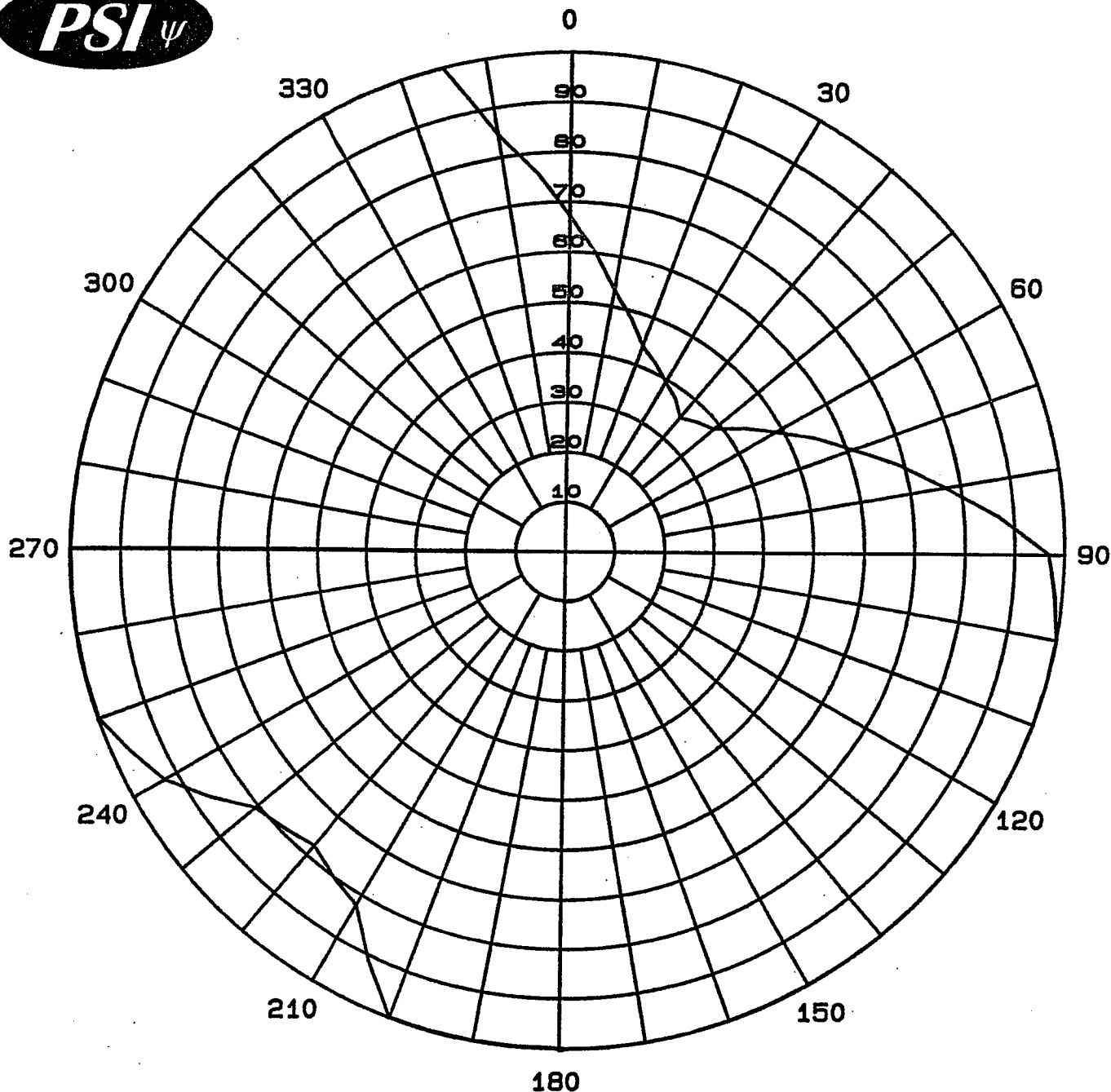


SPECIFICATIONS
RATING: 750 WATTS
GAIN: .59 (-2.29 dB)
WEIGHT: 80.2 LB [36.45 Kg]
WINDAREA: 6.94 Ft ²
TIA-222-F (NO ICE)
NOTE: REFERENCE DRAWING J1209FM-812-023 FOR ADDITIONAL ASSEMBLY DETAILS

MADE BY		DATE		CHANGE		<h1>PROPAGATION SYSTEMS, INC.</h1> <p>Ebensburg, Pennsylvania USA 814-472-5540</p> <h2>ANTENNA ELEVATIONS AND SPECIFICATIONS</h2>					
CHECKED BY											
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 reproduction 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.						MODEL:	PSIFML-1A-DA	DRAWN BY:	D.G. Kellar	DATE:	1/07/10
						CHANNEL/FREQUENCY:	88.5 MHz	APPROVED BY:		DATE:	
						SCALE:	1:20	DRAWING NO.:	J1109FM-812-001	REV.	
						SIZE A					



MADE BY		DATE		CHANGE		PROPAGATION SYSTEMS, INC.					
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						MODEL: PSIFML-1A-DA		DRAWN BY: D.G. Kellar		DATE: 1/07/10	
						CHANNEL/FREQUENCY: 88.5 MHz		APPROVED BY:		DATE:	
						SCALE: 1:20		DRAWING NO.: J1109FM-812-002		REV.	



Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .100 kW (-10.0 dBk)
RMS Envelope: .883
Frequency: 88.5 MHz
KOMQ Omak, WA

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PO Box 113
Ebensburg, PA 15931

Maximum Envelope Tabulation

Antenna: PSIFML-1A-DA

Spokane Public Radio, Inc.

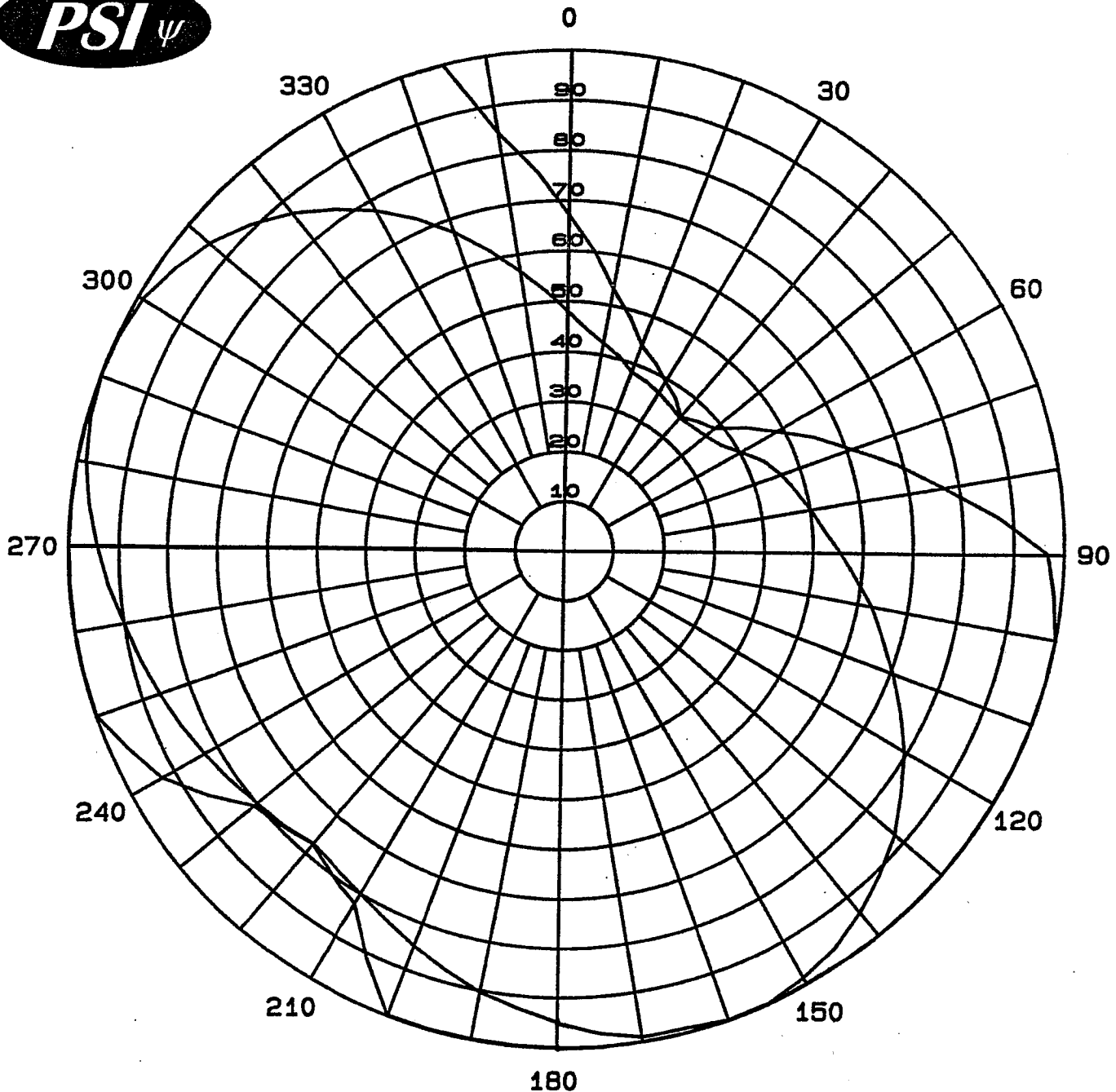
Station: KOMQ

Frequency: 88.5 MHz

Location: Omak, WA

Maximum ERP: .100 kW (-10.0 dBk)

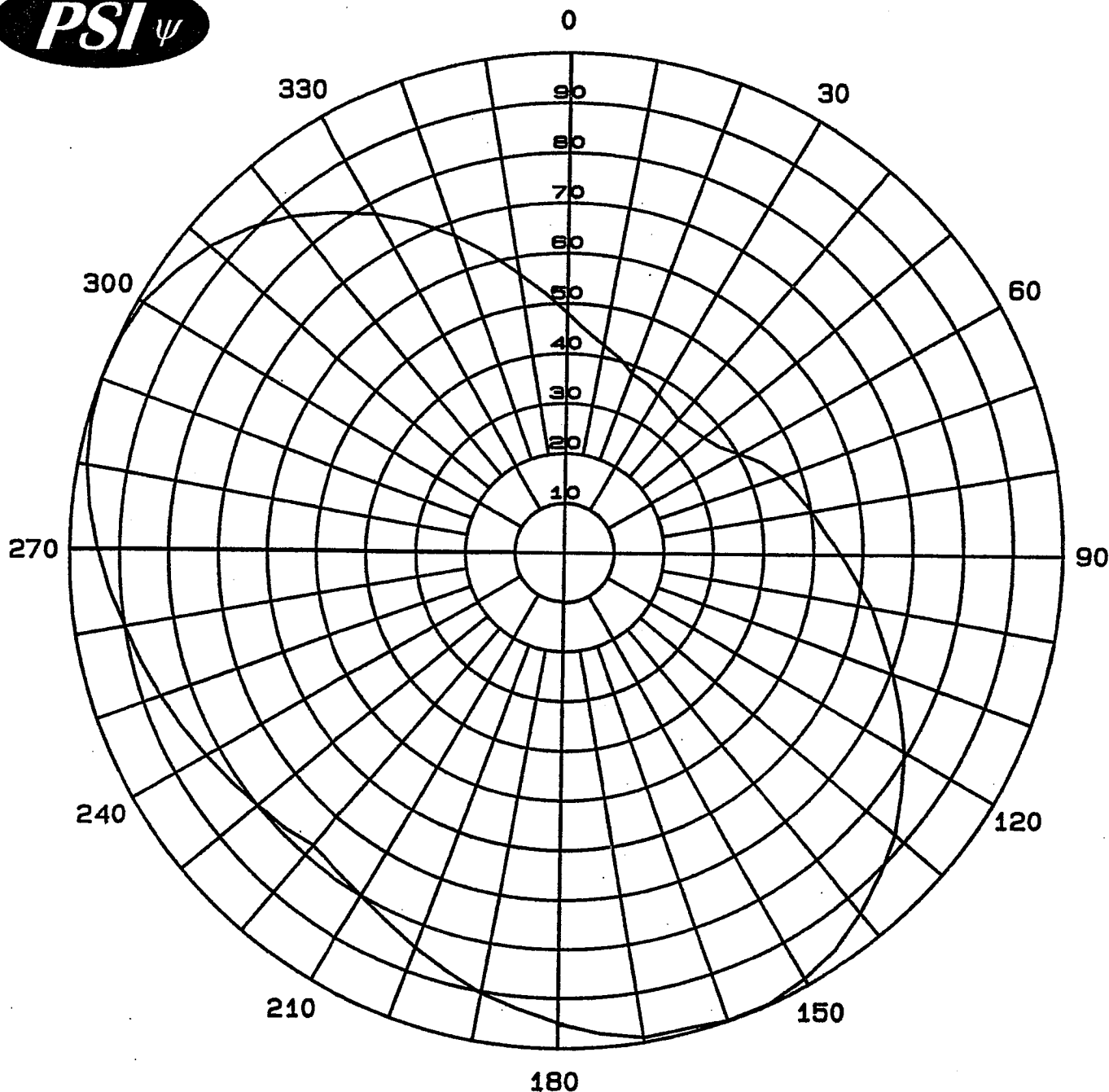
Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.670	0.045	-13.48
10	0.530	0.028	-15.51
20	0.438	0.019	-17.17
30	0.393	0.015	-18.11
40	0.352	0.012	-19.07
50	0.385	0.015	-18.29
60	0.485	0.024	-16.29
70	0.610	0.037	-14.29
80	0.768	0.059	-12.29
90	0.967	0.094	-10.29
100	1.000	0.100	-10.00
110	1.000	0.100	-10.00
120	1.000	0.100	-10.00
130	1.000	0.100	-10.00
140	1.000	0.100	-10.00
150	1.000	0.100	-10.00
160	1.000	0.100	-10.00
165	1.000	0.100	-10.00
170	1.000	0.100	-10.00
180	1.000	0.100	-10.00
190	1.000	0.100	-10.00
200	1.000	0.100	-10.00
210	0.824	0.068	-11.68
220	0.777	0.060	-12.19
230	0.809	0.065	-11.84
240	0.930	0.086	-10.63
250	1.000	0.100	-10.00
260	1.000	0.100	-10.00
270	1.000	0.100	-10.00
280	1.000	0.100	-10.00
290	1.000	0.100	-10.00
300	1.000	0.100	-10.00
310	1.000	0.100	-10.00
320	1.000	0.100	-10.00
330	1.000	0.100	-10.00
340	1.000	0.100	-10.00
350	0.844	0.071	-11.47



Maximum Envelope and
Composite Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .100 kW (-10.0 dBk)
RMS Envelope: .883
RMS Composite: .772
Frequency: 88.5 MHz

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KOMQ Omak, WA



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
ERP: .100 kW (-10.0 dBk)
RMS Composite: .772
Frequency: 88.5 MHz
KOMQ Omak, WA

Propagation Systems Inc.
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Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFML-1A-DA

Spokane Public Radio, Inc.

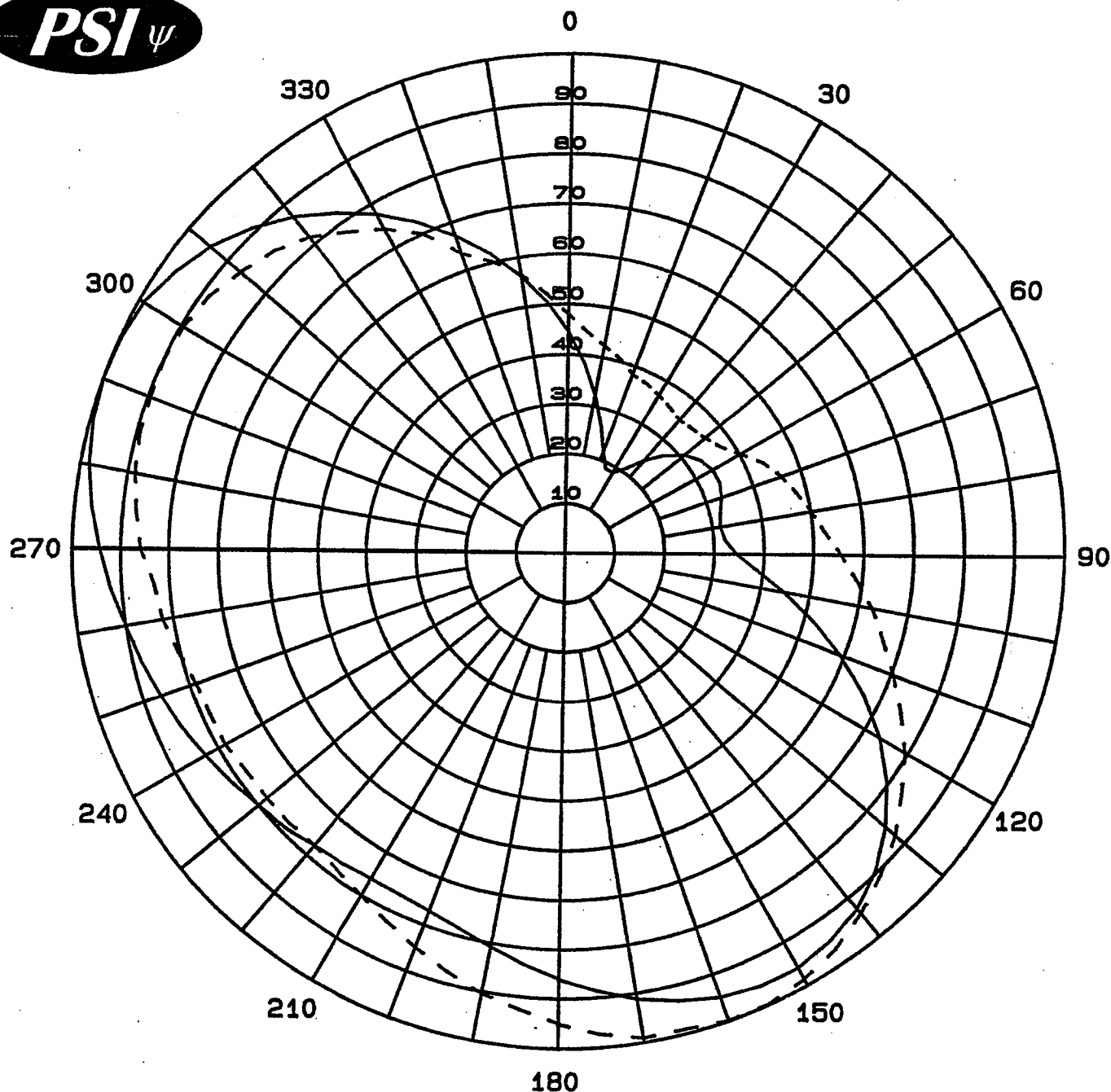
Station: KOMQ

Frequency: 88.5 MHz

Location: Omak, WA

Maximum ERP: .100 kW (-10.0 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.479	0.023	-16.39
10	0.422	0.018	-17.49
20	0.382	0.015	-18.36
30	0.367	0.013	-18.71
40	0.350	0.012	-19.12
50	0.362	0.013	-18.83
60	0.402	0.016	-17.92
70	0.459	0.021	-16.76
80	0.501	0.025	-16.00
90	0.554	0.031	-15.13
100	0.628	0.039	-14.04
110	0.705	0.050	-13.04
120	0.795	0.063	-11.99
130	0.877	0.077	-11.14
140	0.941	0.089	-10.53
150	0.987	0.097	-10.11
160	1.000	0.100	-10.00
170	0.992	0.098	-10.07
180	0.950	0.090	-10.45
190	0.904	0.082	-10.88
200	0.849	0.072	-11.42
210	0.801	0.064	-11.93
220	0.776	0.060	-12.20
230	0.800	0.064	-11.94
240	0.831	0.069	-11.61
250	0.864	0.075	-11.27
260	0.900	0.081	-10.92
270	0.944	0.089	-10.50
280	0.983	0.097	-10.15
290	1.000	0.100	-10.00
300	0.989	0.098	-10.10
310	0.943	0.089	-10.51
320	0.870	0.076	-11.21
330	0.778	0.061	-12.18
340	0.673	0.045	-13.44
350	0.565	0.032	-14.96



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFML-1A-DA
Type: 1-Bay Directional FM Antenna
Gain H-pol (solid): .59 (-2.29 dB)
Gain V-pol (dash): .59 (-2.29 dB)
Frequency: 88.5 MHz
KOMQ Omak, WA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFML-1A-DA
Spokane Public Radio, Inc
Station: KOMQ
Frequency: 88.5 MHz
Location: Omak, WA

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.445	0.117	-9.32
10	0.321	0.061	-12.16
20	0.215	0.027	-15.64
30	0.185	0.020	-16.95
40	0.244	0.035	-14.54
50	0.308	0.056	-12.52
60	0.338	0.067	-11.71
70	0.332	0.065	-11.87
80	0.315	0.059	-12.33
90	0.343	0.069	-11.59
100	0.449	0.119	-9.25
110	0.593	0.207	-6.83
120	0.736	0.320	-4.95
130	0.851	0.427	-3.69
140	0.929	0.509	-2.93
150	0.961	0.545	-2.64
160	0.951	0.534	-2.73
170	0.913	0.492	-3.08
180	0.859	0.435	-3.61
190	0.808	0.385	-4.14
200	0.770	0.350	-4.56
210	0.762	0.343	-4.65
220	0.776	0.355	-4.49
230	0.800	0.378	-4.23
240	0.831	0.407	-3.90
250	0.864	0.440	-3.56
260	0.900	0.478	-3.21
270	0.944	0.526	-2.79
280	0.983	0.570	-2.44
290	1.000	0.590	-2.29
300	0.989	0.577	-2.39
310	0.943	0.525	-2.80
320	0.870	0.447	-3.50
330	0.778	0.357	-4.47
340	0.673	0.267	-5.73
350	0.561	0.186	-7.31

Maximum Value

Field 1.00
Gain .59 (-2.29 dB)
Azimuth Bearing 290 degrees

Minimum Field

Field 0.185
Gain .020 (-16.95 dB)
Azimuth Bearing 30 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.479	0.135	-8.68
10	0.422	0.105	-9.79
20	0.382	0.086	-10.65
30	0.367	0.079	-11.00
40	0.350	0.072	-11.41
50	0.362	0.077	-11.12
60	0.402	0.095	-10.21
70	0.459	0.124	-9.06
80	0.501	0.148	-8.29
90	0.554	0.181	-7.42
100	0.628	0.233	-6.33
110	0.705	0.293	-5.33
120	0.795	0.373	-4.28
130	0.877	0.454	-3.43
140	0.941	0.522	-2.82
150	0.987	0.575	-2.41
160	1.000	0.590	-2.29
170	0.992	0.581	-2.36
180	0.950	0.532	-2.74
190	0.904	0.482	-3.17
200	0.849	0.425	-3.71
210	0.801	0.379	-4.22
220	0.775	0.354	-4.51
230	0.778	0.357	-4.47
240	0.785	0.364	-4.39
250	0.788	0.366	-4.36
260	0.823	0.400	-3.98
270	0.859	0.435	-3.61
280	0.885	0.462	-3.35
290	0.895	0.473	-3.26
300	0.894	0.472	-3.26
310	0.865	0.441	-3.55
320	0.818	0.395	-4.04
330	0.744	0.327	-4.86
340	0.636	0.239	-6.22
350	0.565	0.188	-7.25

Maximum Value

Field 1.00
Gain .59 (-2.29 dB)
Azimuth Bearing 160 degrees

Minimum Field

Field 0.350
Gain .072 (-11.41 dB)
Azimuth Bearing 40 degrees

ERP Tabulation

Antenna: PSIFML-1A-DA

Spokane Public Radio, Inc

Station: KOMQ

Frequency: 88.5 MHz

Location: Omak, WA

Maximum ERP: .100 kW (-10.0 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.445	0.020	-17.03
10	0.321	0.010	-19.87
20	0.215	0.005	-23.35
30	0.185	0.003	-24.66
40	0.244	0.006	-22.25
50	0.308	0.009	-20.23
60	0.338	0.011	-19.42
70	0.332	0.011	-19.58
80	0.315	0.010	-20.03
90	0.343	0.012	-19.29
100	0.449	0.020	-16.96
110	0.593	0.035	-14.54
120	0.736	0.054	-12.66
130	0.851	0.072	-11.40
140	0.929	0.086	-10.64
150	0.961	0.092	-10.35
160	0.951	0.090	-10.44
170	0.913	0.083	-10.79
180	0.859	0.074	-11.32
190	0.808	0.065	-11.85
200	0.770	0.059	-12.27
210	0.762	0.058	-12.36
220	0.776	0.060	-12.20
230	0.800	0.064	-11.94
240	0.831	0.069	-11.61
250	0.864	0.075	-11.27
260	0.900	0.081	-10.92
270	0.944	0.089	-10.50
280	0.983	0.097	-10.15
290	1.000	0.100	-10.00
300	0.989	0.098	-10.10
310	0.943	0.089	-10.51
320	0.870	0.076	-11.21
330	0.778	0.061	-12.18
340	0.673	0.045	-13.44
350	0.561	0.031	-15.02

Maximum Value (H-pol)

Field 1.00

ERP .100 kW (-10.0 dBk)

Azimuth Bearing 290 degrees

Minimum Field (H-pol)

Field 0.185

ERP .003 kW (-24.66 dBk)

Azimuth Bearing 30 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.479	0.023	-16.39
10	0.422	0.018	-17.49
20	0.382	0.015	-18.36
30	0.367	0.013	-18.71
40	0.350	0.012	-19.12
50	0.362	0.013	-18.83
60	0.402	0.016	-17.92
70	0.459	0.021	-16.76
80	0.501	0.025	-16.00
90	0.554	0.031	-15.13
100	0.628	0.039	-14.04
110	0.705	0.050	-13.04
120	0.795	0.063	-11.99
130	0.877	0.077	-11.14
140	0.941	0.089	-10.53
150	0.987	0.097	-10.11
160	1.000	0.100	-10.00
170	0.992	0.098	-10.07
180	0.950	0.090	-10.45
190	0.904	0.082	-10.88
200	0.849	0.072	-11.42
210	0.801	0.064	-11.93
220	0.775	0.060	-12.21
230	0.778	0.061	-12.18
240	0.785	0.062	-12.10
250	0.788	0.062	-12.07
260	0.823	0.068	-11.69
270	0.859	0.074	-11.32
280	0.885	0.078	-11.06
290	0.895	0.080	-10.96
300	0.894	0.080	-10.97
310	0.865	0.075	-11.26
320	0.818	0.067	-11.74
330	0.744	0.055	-12.57
340	0.636	0.040	-13.93
350	0.565	0.032	-14.96

Maximum Value (V-pol)

Field 1.00

ERP .100 kW (-10.0 dBk)

Azimuth Bearing 160 degrees

Minimum Field (V-pol)

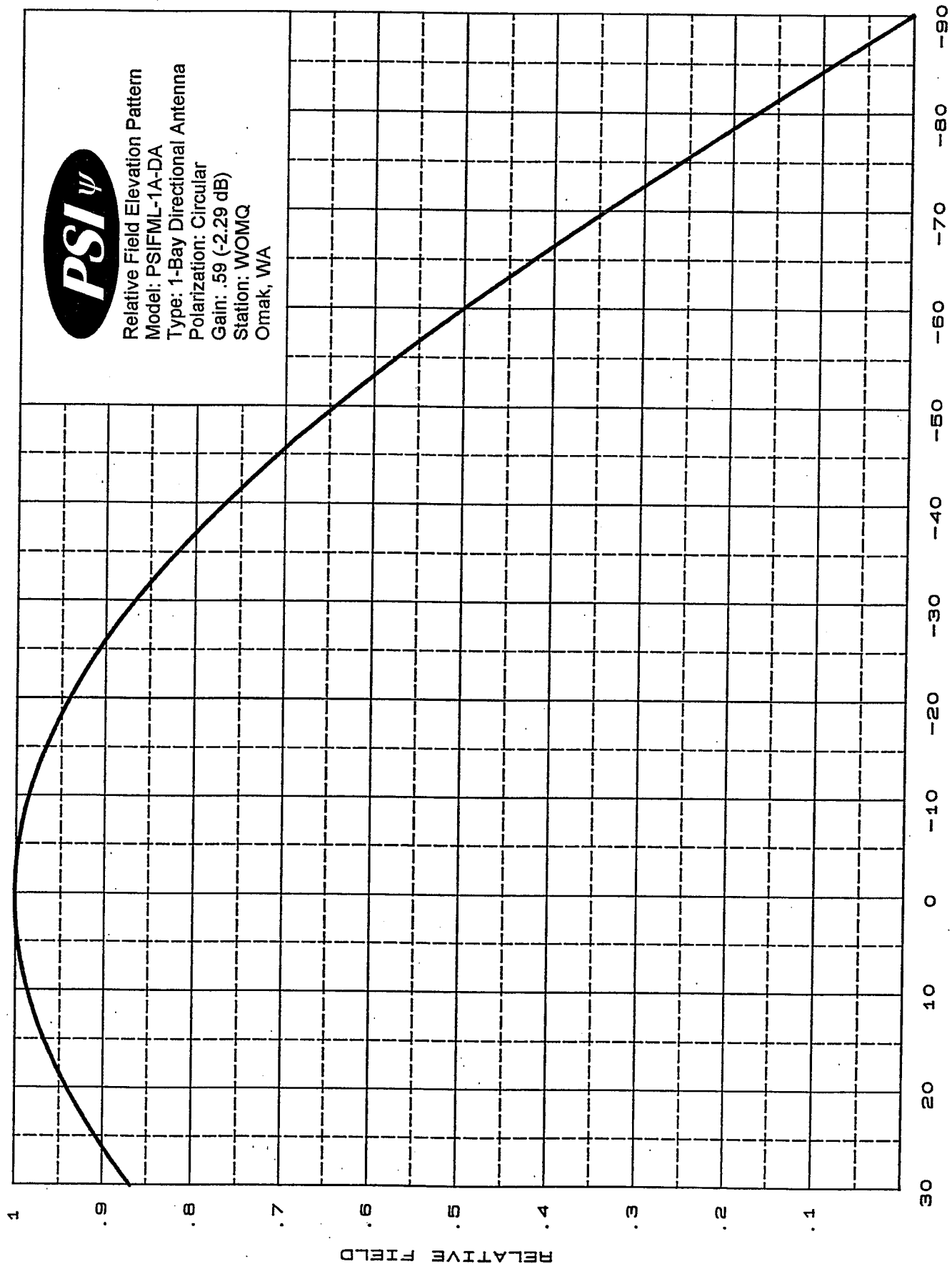
Field 0.350

ERP .012 kW (-19.12 dBk)

Azimuth Bearing 40 degrees



Relative Field Elevation Pattern
Model: PSIFML-1A-DA
Type: 1-Bay Directional Antenna
Polarization: Circular
Gain: .59 (-2.29 dB)
Station: WOMQ
Omak, WA



DEGREES BELOW HORIZONTAL