Propagation Systems, Inc.
Quality Broadcast Antenna Systems

Directional FM Antenna
WJCS
Beacon Broadcasting Corp.
Allentown, PA

A custom designed PSIFLV antenna element was used in conjunction with the customer's triangular face tower to create the necessary directional radiation pattern. The final antenna consists of six vertically polarized radiating elements each spaced one wavelength and fed with equal power and phase. The horizontal component of this antenna is created by constructing the vertical dipole element 1° off the vertical plane. Each bay has two vertical parasitic elements attached to the antenna boom and one vertical parasitic element attached to the southwest tower leg to shape the azimuth pattern. The antenna is secured to the tower with custom-mounting brackets and support mast. The antenna bays are fed from a 1/2", flexible coaxial cable originating from a 6-way power divider.

Pattern testing was performed using a 1/3 scale model element and tower. All existing transmission lines, metallic structures and appurtenances were present during pattern testing. 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 267.9 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 86.1% of the envelope RMS.

PO Box 113 • 719 Pensacola Rd • Ebensburg • PA • 15931 • Phone (814) 472-5540 • Fax (814) 472-5676
www.psibroadcast.com

The antenna is to be mounted with the center of radiation at 147 meters (482.2 ft) above ground level on the northeast tower leg. At this elevation the antenna will be within the allowed +2m/-4m tolerance allowed by the FCC. The antenna is to be positioned 14° 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 13.82 watts will be required at the antenna input in order to reach the licensed .120 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

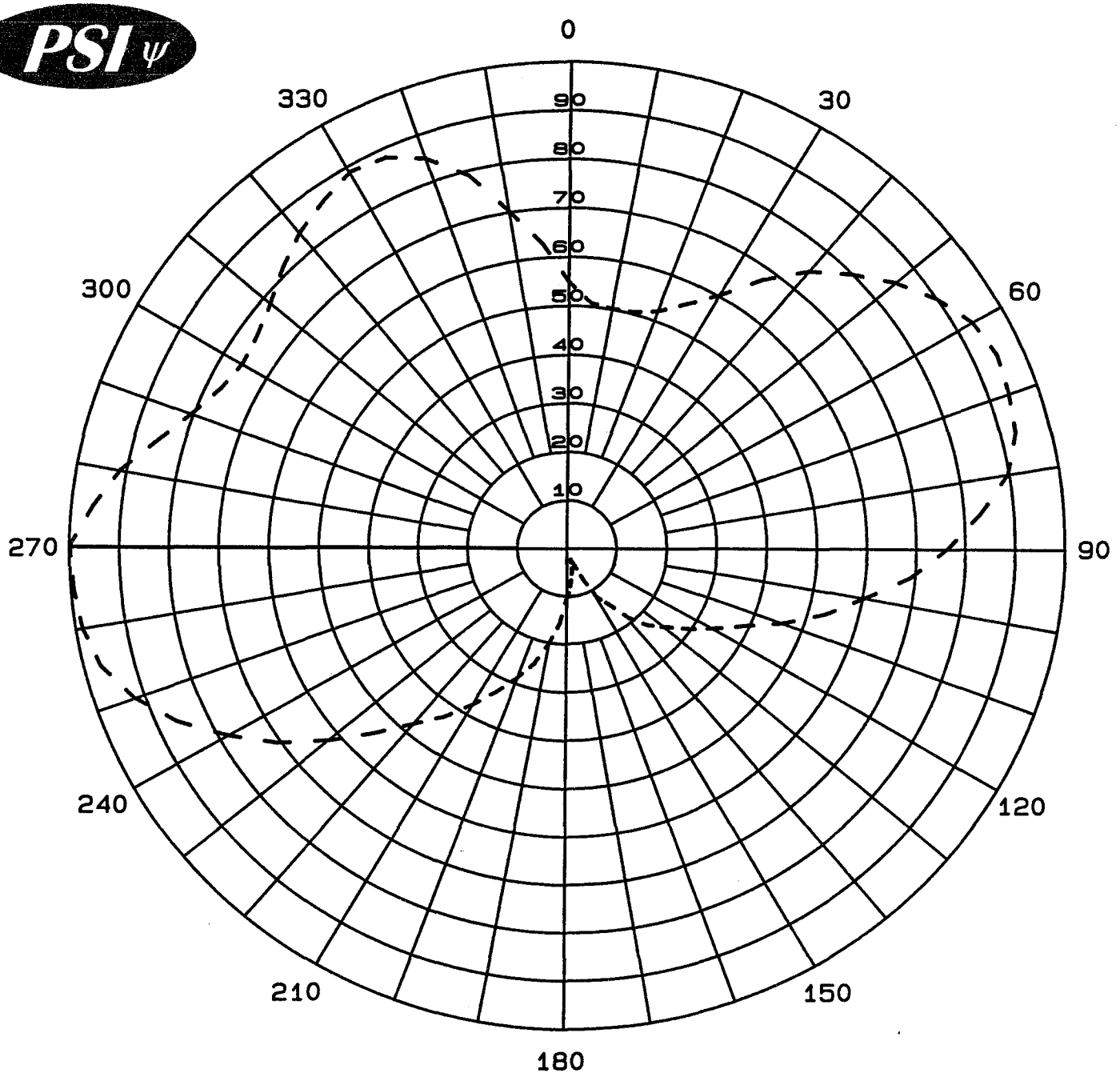
Antenna Model	PSIFLV-6A-DA
Type	6-bay directional FM antenna
Bay Spacing	full wave spaced elements
Frequency	89.3 MHz
Polarization	Vertical/mixed
Envelope RMS	.777
Measured RMS	.669
Gain (v-pol)	8.68 (9.39 dB)
ERP (v-pol)	.120 kW (-9.21 dBk)
ERP (h-pol)	.0001 kW (-40.0 dBk)
Input Power	.01382 kW
Input Type	7/8" EIA end fed
Power Rating	1 kW
Antenna Aperture	55.07 ft.
Antenna Weight	291 lbs.
Antenna Wind Area	17.41 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 6/30/09

Douglas A. Ross
President
Propagation Systems Inc.



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFLV-6A-DA
Type:6-Bay Directional FM Antenna
Polarization: Vertical/Mixed
Gain (V-pol): 8.68 (9.39 dB)
Station: WJCS
Location: Allentown, PA

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFLV-6A-DA
Station: WJCS
Frequency: 89.3 MHz
Location: Allentown, PA

Vertical Component
Measured Relative Field

Angle	Relative Field	Power Gain	Gain dB
0	0.547	2.60	4.14
10	0.498	2.15	3.33
20	0.517	2.32	3.66
30	0.598	3.10	4.92
40	0.744	4.80	6.82
50	0.851	6.29	7.98
60	0.933	7.56	8.78
70	0.940	7.67	8.85
80	0.897	6.98	8.44
90	0.763	5.05	7.04
100	0.602	3.15	4.98
110	0.461	1.84	2.66
120	0.340	1.00	0.01
130	0.259	0.58	-2.35
140	0.192	0.32	-4.95
150	0.122	0.13	-8.89
160	0.038	0.01	-19.02
170	0.049	0.02	-16.81
180	0.101	0.09	-10.53
190	0.199	0.34	-4.64
200	0.286	0.71	-1.49
210	0.375	1.22	0.87
220	0.478	1.98	2.97
230	0.627	3.41	5.33
240	0.785	5.35	7.28
250	0.922	7.38	8.68
260	0.987	8.46	9.27
270	1.000	8.68	9.39
280	0.912	7.22	8.59
290	0.803	5.60	7.48
300	0.757	4.97	6.97
310	0.783	5.32	7.26
320	0.844	6.18	7.91
330	0.888	6.84	8.35
340	0.849	6.26	7.96
350	0.700	4.25	6.29

Maximum Field (V-pol)

Field	1.00
Gain	8.68 (9.39 dB)
Azimuth Bearing	270 degrees

Minimum Field (V-pol)

Field	0.026
Gain	.006 (-22.32 dB)
Azimuth Bearing	165 degrees

ERP Tabulation

Antenna: PSIFLV-6A-DA
Station: WJCS
Frequency: 89.3 MHz
Location: Allentown, PA
Maximum ERP: .120 kW (-9.21 dBk)

Vertical Component

Angle	Relative Field	ERP kW	ERP dBk
0	0.547	0.0359	-14.45
10	0.498	0.0298	-15.26
20	0.517	0.0321	-14.94
30	0.598	0.0429	-13.67
40	0.744	0.0664	-11.78
50	0.851	0.0869	-10.61
60	0.933	0.1045	-9.81
70	0.940	0.1060	-9.75
80	0.897	0.0966	-10.15
90	0.763	0.0699	-11.56
100	0.602	0.0435	-13.62
110	0.461	0.0255	-15.93
120	0.340	0.0139	-18.58
130	0.259	0.0080	-20.94
140	0.192	0.0044	-23.54
150	0.122	0.0018	-27.48
160	0.038	0.0002	-37.61
170	0.049	0.0003	-35.40
180	0.101	0.0012	-29.12
190	0.199	0.0048	-23.23
200	0.286	0.0098	-20.08
210	0.375	0.0169	-17.73
220	0.478	0.0274	-15.62
230	0.627	0.0472	-13.26
240	0.785	0.0739	-11.31
250	0.922	0.1020	-9.91
260	0.987	0.1169	-9.32
270	1.000	0.1200	-9.21
280	0.912	0.0998	-10.01
290	0.803	0.0774	-11.11
300	0.757	0.0688	-11.63
310	0.783	0.0736	-11.33
320	0.844	0.0855	-10.68
330	0.888	0.0946	-10.24
340	0.849	0.0865	-10.63
350	0.700	0.0588	-12.31

Maximum ERP (V-pol)

Field	1.00
ERP	.120 kW (-9.21 dBk)
Azimuth Bearing	270 degrees

Minimum ERP

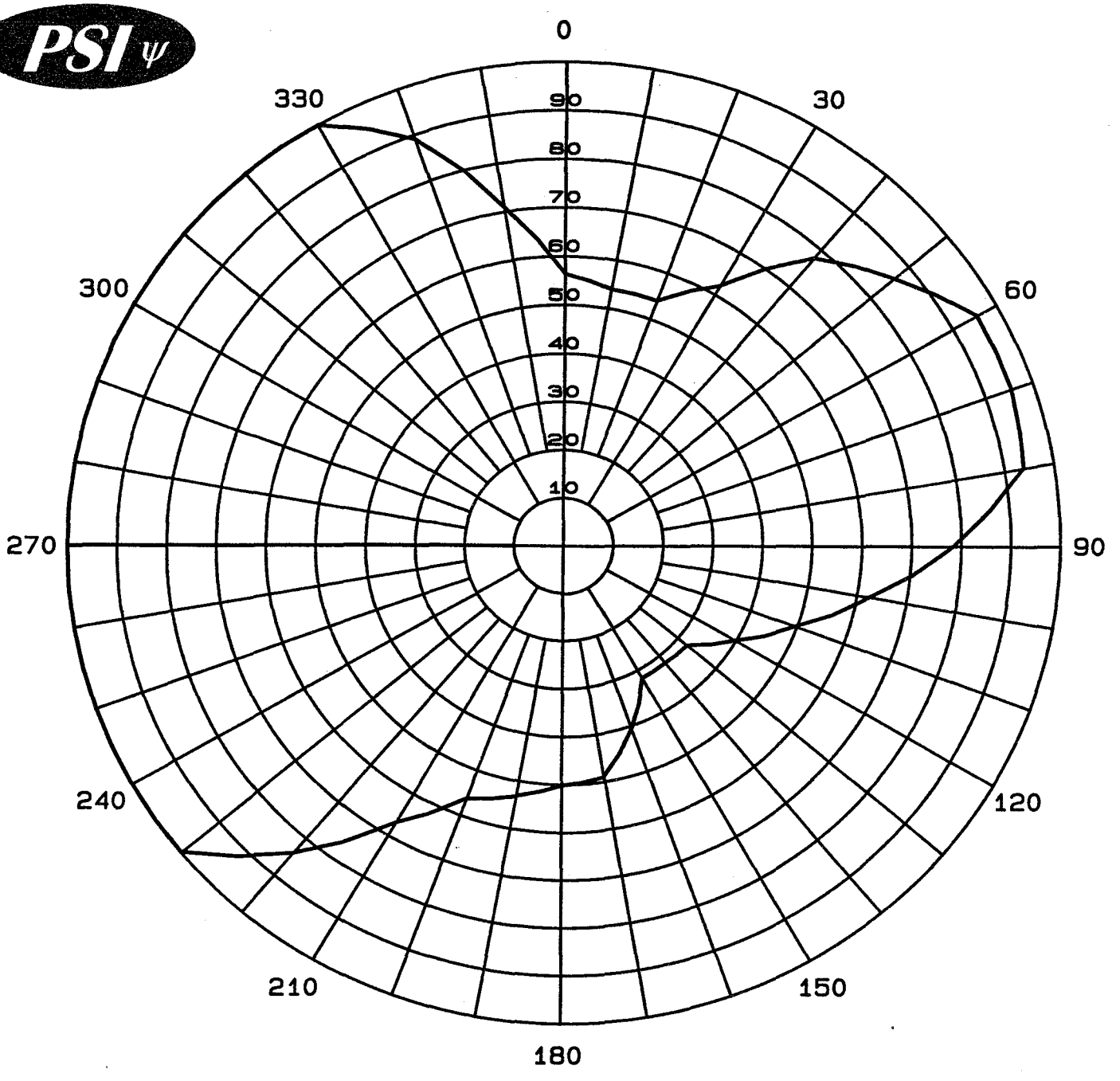
Field	0.026
ERP	.08 W (-40.91 dBk)
Azimuth Bearing	165 degrees

ERP Tabulation

Antenna: PSIFLV-6A-DA
Station: WJCS
Frequency: 89.3 MHz
Location: Allentown, PA
Maximum ERP: .0001 kW (-40.0 dBk)

Horizontal Component

Angle	Relative Field	ERP kW	ERP dBk
0	0.029	0.0001	-40.0
10	0.029	0.0001	-40.0
20	0.029	0.0001	-40.0
30	0.029	0.0001	-40.0
40	0.029	0.0001	-40.0
50	0.029	0.0001	-40.0
60	0.029	0.0001	-40.0
70	0.029	0.0001	-40.0
80	0.029	0.0001	-40.0
90	0.029	0.0001	-40.0
100	0.029	0.0001	-40.0
110	0.029	0.0001	-40.0
120	0.029	0.0001	-40.0
130	0.029	0.0001	-40.0
140	0.029	0.0001	-40.0
150	0.029	0.0001	-40.0
160	0.029	0.0001	-40.0
170	0.029	0.0001	-40.0
180	0.029	0.0001	-40.0
190	0.029	0.0001	-40.0
200	0.029	0.0001	-40.0
210	0.029	0.0001	-40.0
220	0.029	0.0001	-40.0
230	0.029	0.0001	-40.0
240	0.029	0.0001	-40.0
250	0.029	0.0001	-40.0
260	0.029	0.0001	-40.0
270	0.029	0.0001	-40.0
280	0.029	0.0001	-40.0
290	0.029	0.0001	-40.0
300	0.029	0.0001	-40.0
310	0.029	0.0001	-40.0
320	0.029	0.0001	-40.0
330	0.029	0.0001	-40.0
340	0.029	0.0001	-40.0
350	0.029	0.0001	-40.0



Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFLV-6A-DA
Type:6-Bay Directional FM Antenna
Polarization: Vertical/Mixed
ERP (V-pol): .120 kW (-9.21 dBk)
ERP (H-pol): .0001 kW (-40.0 dBk)
Station: WJCS

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

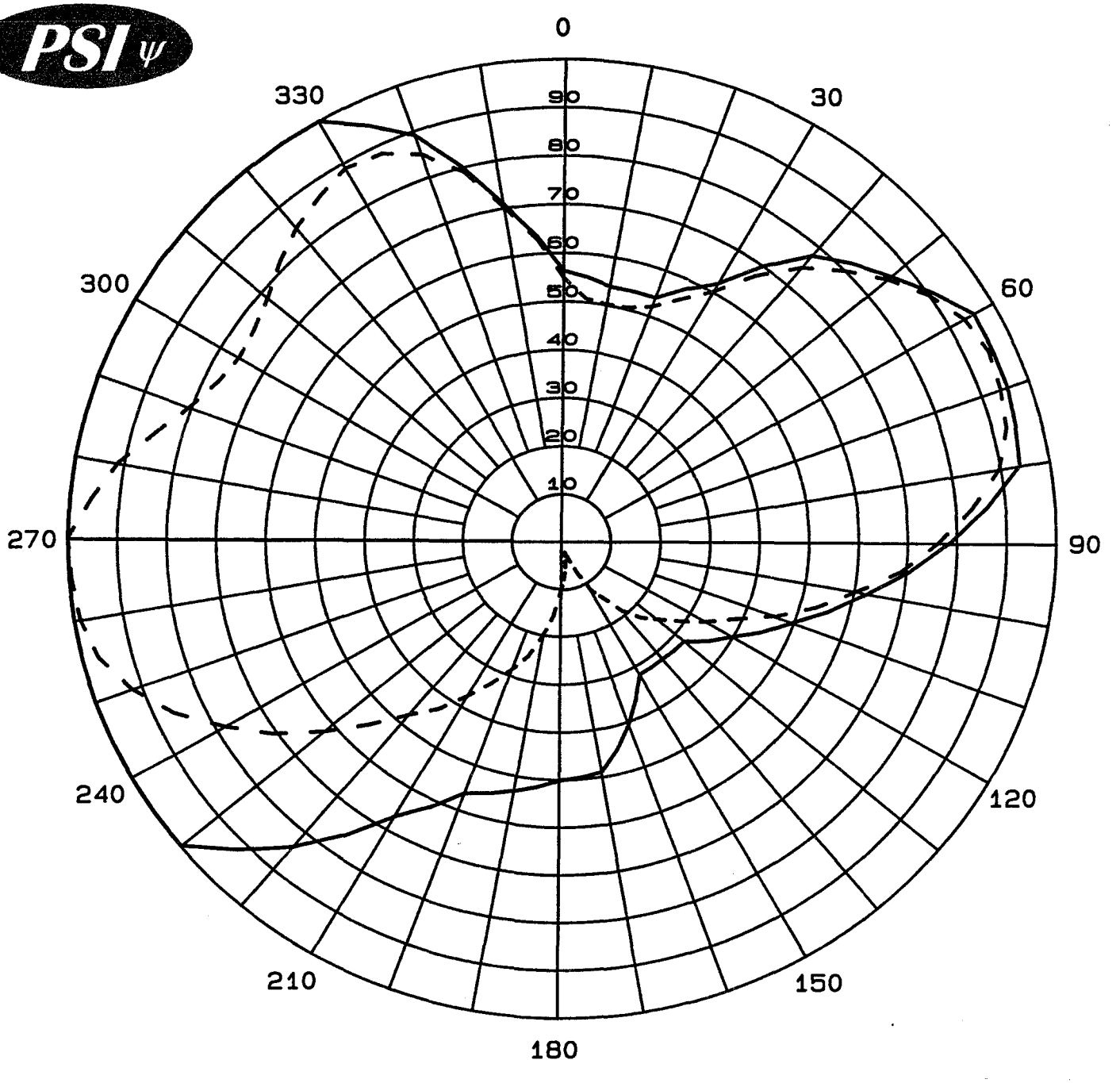
Location: Allentown, PA

Envelope Pattern

Antenna: PSIFLV-6A-DA
Station: WJCS
Frequency: 89.3 MHz
Location: Allentown, PA
Maximum ERP: .120 kW (-9.21 dBk)

Vertical Component

Angle	Relative Field	ERP kW	ERP dBk
0	0.562	0.038	-14.21
10	0.537	0.035	-14.61
20	0.537	0.035	-14.61
30	0.617	0.046	-13.40
40	0.776	0.072	-11.41
50	0.861	0.089	-10.51
60	0.955	0.109	-9.61
70	0.955	0.109	-9.61
80	0.939	0.106	-9.75
90	0.785	0.074	-11.31
100	0.624	0.047	-13.30
110	0.495	0.029	-15.32
120	0.398	0.019	-17.21
130	0.325	0.013	-18.97
140	0.320	0.012	-19.11
150	0.320	0.012	-19.11
160	0.407	0.020	-17.02
170	0.490	0.029	-15.40
180	0.501	0.030	-15.21
190	0.531	0.034	-14.71
200	0.562	0.038	-14.21
210	0.668	0.054	-12.71
220	0.841	0.085	-10.71
230	1.000	0.120	-9.21
240	1.000	0.120	-9.21
250	1.000	0.120	-9.21
260	1.000	0.120	-9.21
270	1.000	0.120	-9.21
280	1.000	0.120	-9.21
290	1.000	0.120	-9.21
300	1.000	0.120	-9.21
310	1.000	0.120	-9.21
320	1.000	0.120	-9.21
330	1.000	0.120	-9.21
340	0.891	0.095	-10.21
350	0.708	0.060	-12.21



Maximum Envelope and
Measured Azimuth Plane Pattern
Antenna: PSIFLV-6A-DA
Type:6-Bay Directional FM Antenna
Polarization: Vertical/Mixed
RMS Envelope: .777
RMS Measured Pattern: .669
Station: WJCS

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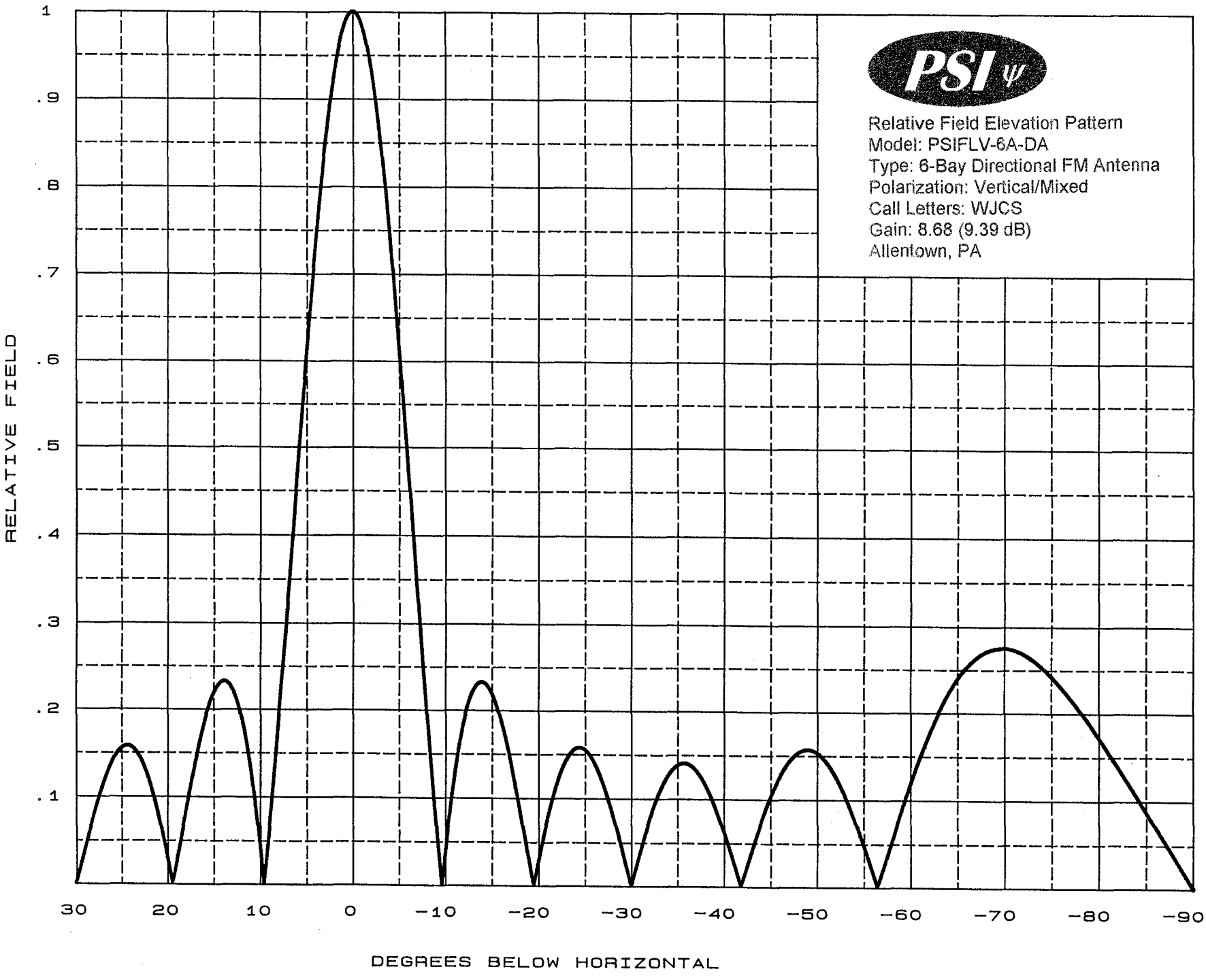
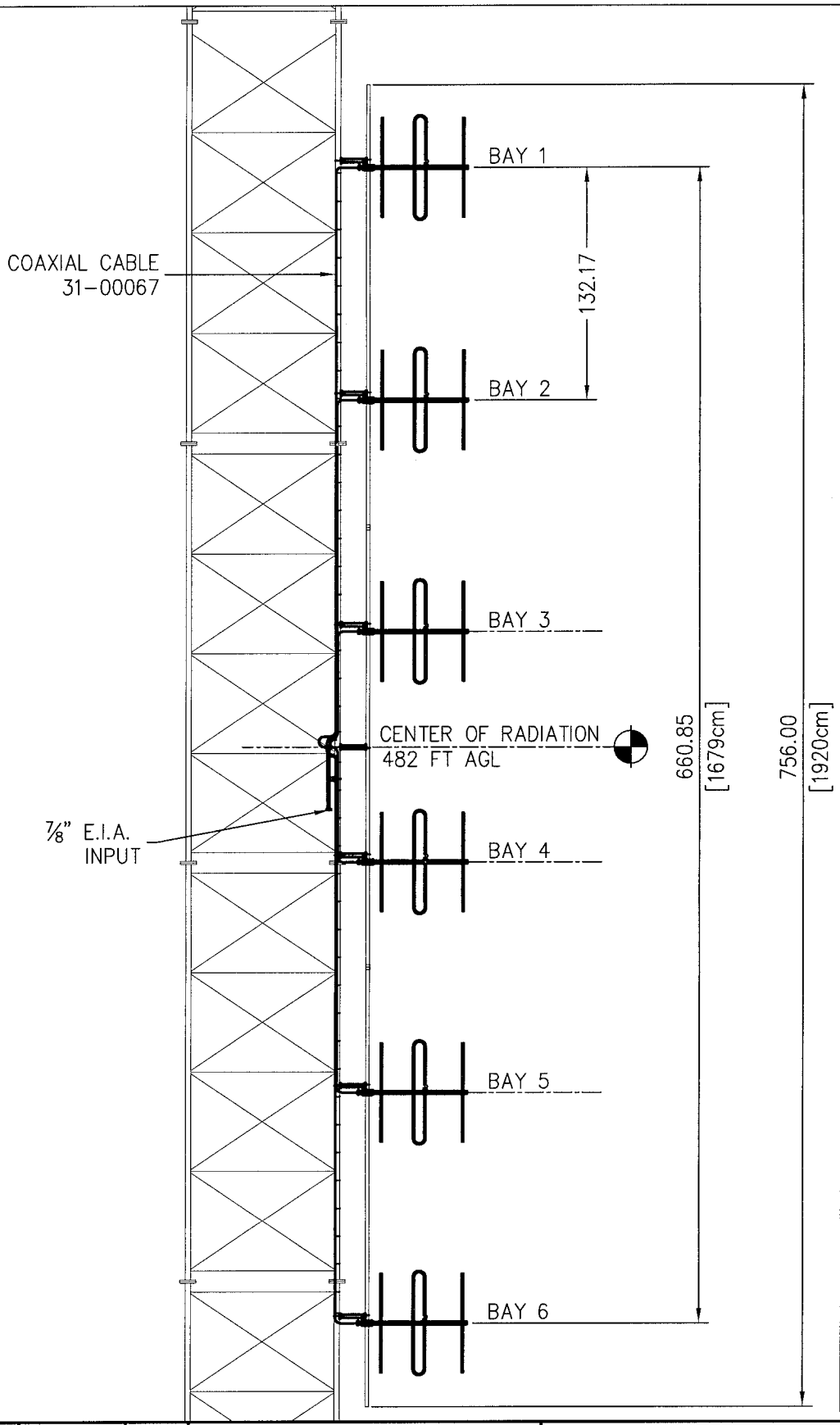
Ebensburg, PA 15931

Location: Allentown, PA


PSI
Relative Field Elevation Pattern
Model: PSIFLV-6A-DA
Type: 6-Bay Directional FM Antenna
Polarization: Vertical/Mixed
Call Letters: WJCS
Gain: 8.68 (9.39 dB)
Allentown, PA
RELATIVE FIELD
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
DEGREES BELOW HORIZONTAL



SPECIFICATIONS
SPACING: 1.0λ
APERTURE: 55.07 Ft [16.79m]
RATING: 1 kW
GAIN: 8.68 (9.39 dB)
WEIGHT: 291 Lb [132.3 Kg]
WINDAREA: 17.41 Ft^2 TIA-222-F (NO ICE)
MAST SPECIFICATIONS
LENGTH: 63 Ft [19.2m]
WEIGHT: 209.7 Lb [95.1 Kg]
WINDAREA: 13.02 Ft^2 TIA-222-F (NO ICE)

NOTE:
1. REF. J609FM-772-031 FOR ASSEMBLY DETAILS
2. MAST SPECIFICATIONS INCLUDE MOUNTING BRACCKETS

REV.	MADE BY / CHECKED BY	DATE	CHANGE

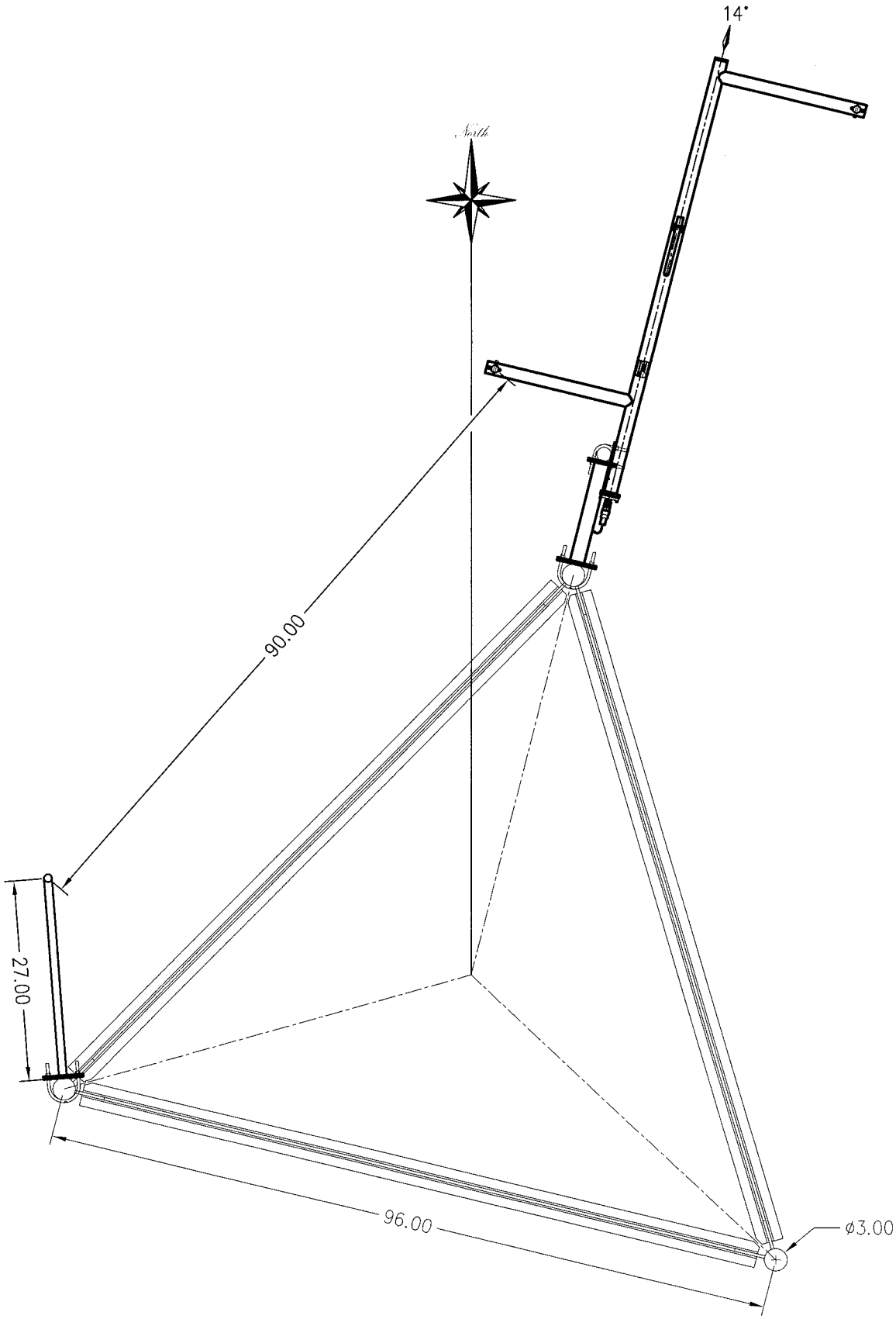
SIZE: A

PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATIONS AND SPECIFICATIONS

MODEL:	DRAWN BY:	DATE:
PSIFLV-6A-DA	D.G. Kellar	6/11/09
CHANNEL/ FREQUENCY: 89.3 MHz	APPROVED BY:	DATE:
SCALE: 1:90	DRAWING NO.: J609FM-772-001	REV.



REV.	MADE BY / CHECKED BY	DATE	CHANGE

SIZE: A

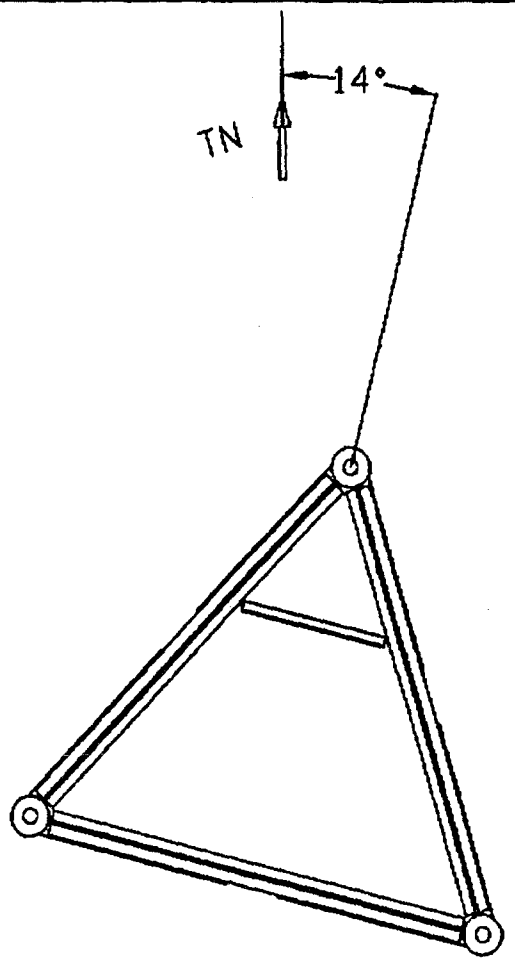
PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA PLANVIEW AND ORIENTATION

MODEL: PSIFLV-6A-DA	DRAWN BY: D.G. Kellar	DATE: 6/10/09	
CHANNEL / FREQUENCY: 89.3 MHz	APPROVED BY:	DATE:	
SCALE: 1:20	DRAWING NO.: J609FM-772-002	REV.	

LOB 772



WFMZ - TV 69

TOWER ORIENTATION

SIZE	DWG NO.	REV
	Engr\Tower Information\Tower Orientation.dwg	
SCALE		SHEET