

ENGINEERING STATEMENT
IN SUPPORT OF AN APPLICATION FOR
LICENSE TO COVER CONSTRUCTION PERMIT (BMXPH-20151008ACG)
FOR AUXILIARY OPERATION
WJKI(FM), BETHANY BEACH, DELAWARE
CHANNEL 278A 4.3 KW DA 74.6 METERS

OCTOBER 2015

This engineering statement has been prepared on behalf of Great Scott Broadcasting, licensee of FM broadcast station WJKI, Bethany Beach, Delaware in support of an application for license to cover construction permit (BMXPH-20151008ACG) for an auxiliary operation.

At present WJKI, (Facility ID Number 30858), is licensed (BLH-19960611KA) to operate on Channel 278A (103.5 MHz) with 1.45 kW effective radiated power (ERP) and 146 meters antenna height above average terrain (HAAT). The present licensed facilities are equivalent to 3 kW ERP and 100 meters HAAT. WJKI has filed an application (BPH-20150626AAS) to relocate the antenna site for its main operation. WJKI has been granted a construction permit (BMXPH-20151008ACG) for an auxiliary operation. An application for license is filed on the FCC Form 302-FM to cover construction permit (BMXPH-20151008ACG).

The following information provides pertinent data for the construction permit (BMXPH-20151008ACG).

Name of the Licensee:	Great Scott Broadcasting			
Station Location:	DE-Bethany Beach			
Frequency (MHz):	103.5 (Channel 278A)			
Hours of Operation:	Unlimited—For auxiliary purposes only			
Transmitter:	Type Accepted			
Antenna Type:	Directional			
Antenna Coordinates:	North Latitude:	38 deg	34 min	45 sec
	West Longitude:	75 deg	17 min	04 sec

Transmitter output power:	As required to achieve authorized ERP
Effective Radiated Power (ERP) (H &V):	4.3 kW 6.33 dBk
Height of Radiation Center Above Ground (H&V):	76 meters
Height of Radiation Center Above Mean Sea Level:	84 meters
Height of Radiation Center Above Average Terrain (HAAT):	75 meters
Antenna Structure Registration Number:	1060051

The WJKI auxiliary facility has been constructed according to the terms and conditions of the granted construction permit (BMXPH-20151008ACG)). The directional antenna proof-of-performance has been provided by the manufacturer to establish the horizontal radiation patterns for both the horizontally and vertically polarized components.

Donald K Miller, a registered surveyor, has provided a certification that the FM antenna has been oriented at the azimuth specified in the directional antenna proof-of-performance.

Also attached is an affidavit from Terry Dalton, a qualified engineer, stating that the directional FM antenna was installed according to the manufacturer's instructions.



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
Great Scott Broadcasting
WJKI-Aux
Bethany Beach, DE**

A standard model PSIFM series antenna was used in conjunction with the customer's triangular tower to create the necessary directional radiation pattern. The final antenna consists of two radiating elements secured to the tower with custom-mounting brackets and support mast. The antenna bays are full-wave spaced and there is one horizontal and two vertical parasitic elements per bay. The antenna array is center fed and each radiating element receives equal power and phase.

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. Two 10 ft. dish antennas mounted on the northwest tower leg at the 256 ft. and 244 ft. elevations were present during pattern testing of the WJKI antenna. The dishes were positioned 321 degrees and 235.1 degrees respectively. All feed cables to the antenna were secured and grounded during pattern measurements. A Hewlett Packard 8753E-network analyzer operating at 310.5 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 87.1% of the envelope RMS.

The antenna is to be mounted 76.2 meters (250 ft.) +/- 1.5 ft. above ground level on the northeast tower leg and positioned 90° True. No other antennas, other than those tested in the aperture of the WJKI antenna can be installed within 15 ft. of any radiating element. Any guy wire that passes within 20 ft. of a radiating element must be changed to the appropriate 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 1.55 kW will be required at the antenna input in order to reach the approved 4.3 kW ERP. The transmitter output power requirements are dependent upon the transmission line size and length used to feed the antenna.

Antenna Specifications

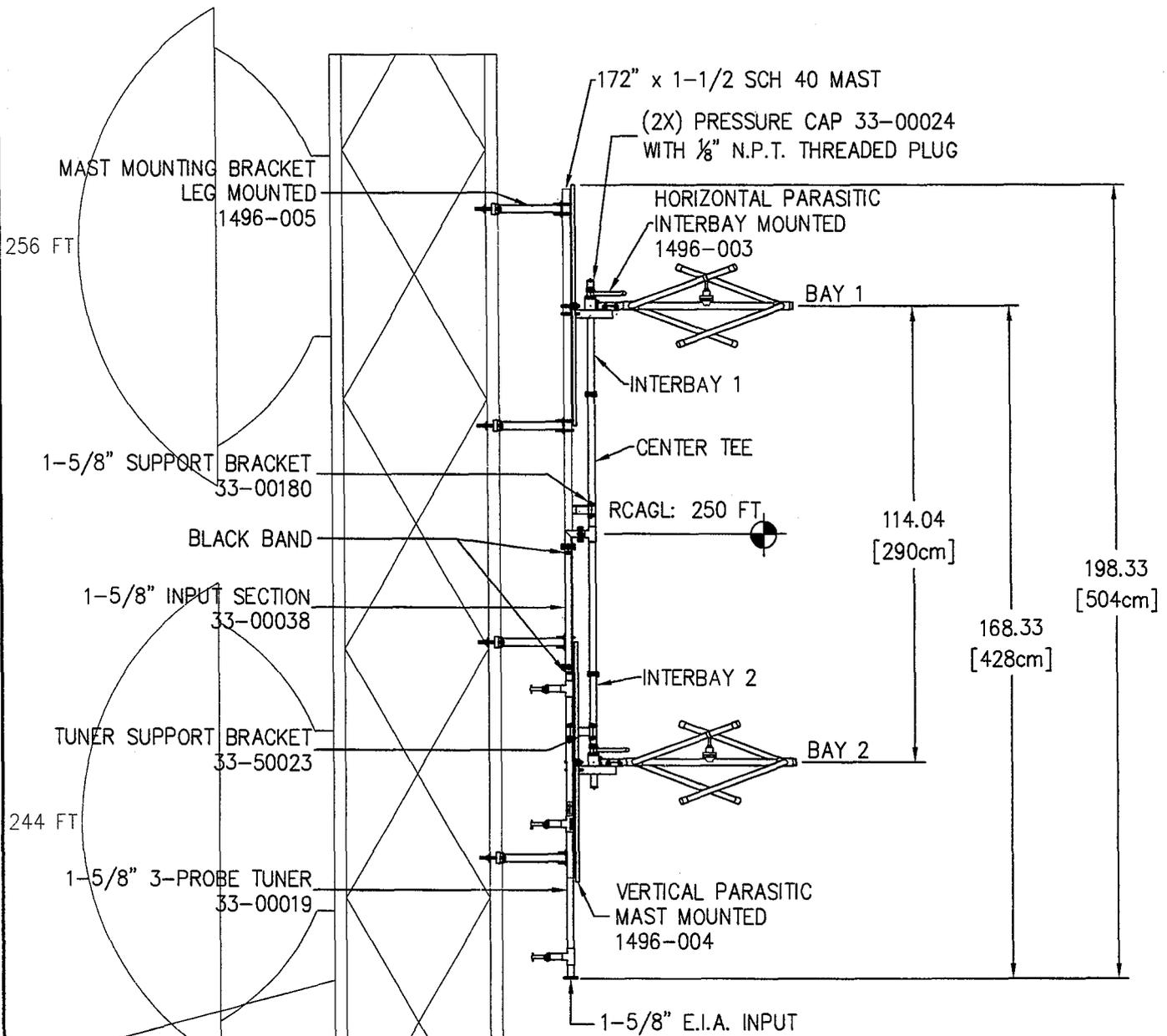
Antenna Model	PSIFM-2C-DA
Type	2-bay directional FM antenna
Bay Spacing	Full-wave spaced elements
Frequency	103.5 MHz
Polarization	Circular
Envelope RMS	.689
Composite RMS	.600
Gain (h-pol)	2.77 (4.42 dB)
Gain (v-pol)	2.47 (3.93 dB)
Antenna Input	1-5/8" EIA center fed input
Power rating	6 kW
Length	16.53 ft.
Weight	164 lbs.
Wind Area	12.52 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.

 9/24/15

Douglas A. Ross
President
Propagation Systems Inc.



SPECIFICATIONS	
SPACING:	1.0 λ
LENGTH:	16.53 FT [5.04 m]
APERTURE:	9.5 FT [2.90 m]
RATING:	6 kW
GAIN:	2.77 (4.42 dB)
WEIGHT:	164 Lbs [74 kg]
WINDAREA:	12.52 FT
TIA-222-F	(NO ICE)

REV.	MADE BY	DATE	CHANGE
	CHECKED BY		

PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATION AND SPECIFICATIONS

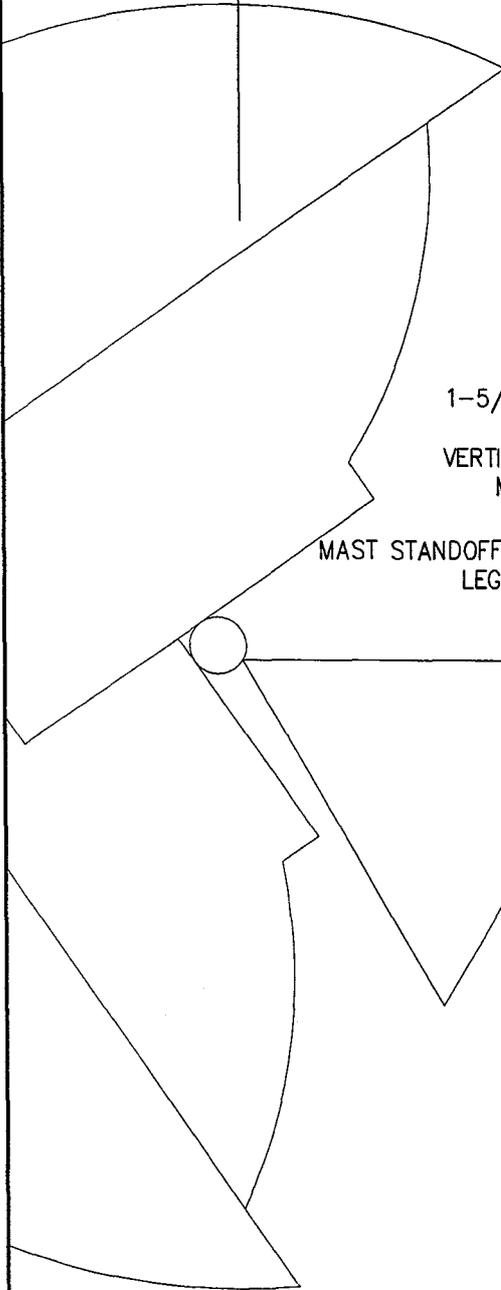
MODEL:	PSIFM-2C-DA	DRAWN BY:	B.K.SCHILLING	DATE:	9/22/15
CHANNEL/FREQUENCY:	103.5 MHz	APPROVED BY:		DATE:	
SCALE:	1:40	DRAWING NO.:	1496-001	REV.	

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

North



BAY MOUNTING BRACKET
33-00242

1-5/8" SUPPORT BRACKET
33-00180

VERTICAL PARASITIC
MAST MOUNTED
1496-004

MAST STANDOFF BRACKET
LEG MOUNTED
1496-005

HORIZONTAL PARASITIC
INTERBAY MOUNTED
1496-003

TYPICAL
ELEMENT

90°

1-5/8" 3-PROBE TUNER
33-00019

REV.	MADE BY	DATE	CHANGE

PROPAGATION SYSTEMS, INC.

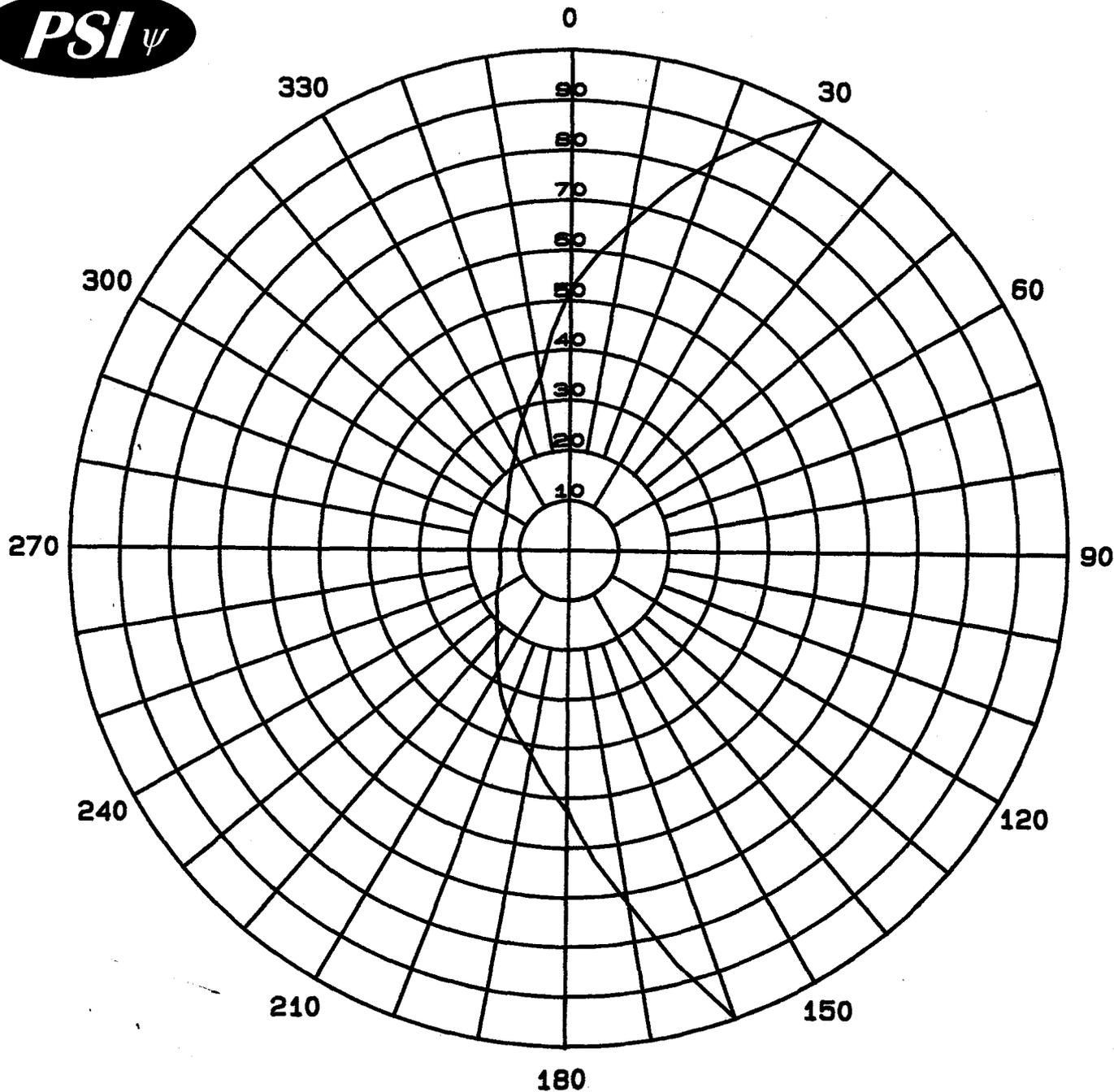
Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA PLAN VIEW AND ORIENTATION

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

MODEL: PSIFM-2C-DA	DRAWN BY: B.K.SCHILLING	DATE: 9/22/15
CHANNEL/ FREQUENCY: 103.5 MHz	APPROVED BY:	DATE:
SCALE: 1:20	DRAWING NO.:	REV.
	1496-002	



Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFM-2C-DA
Type: 2-Bay Directional FM Antenna
ERP: 4.3 kW (6.33 dBk)
RMS Envelope: .689
Frequency: 103.5 MHz
WJKI-Aux Bethany Beach, DE

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Maximum Envelope Tabulation

Antenna: PSIFM-2C-DA

Great Scott Broadcasting

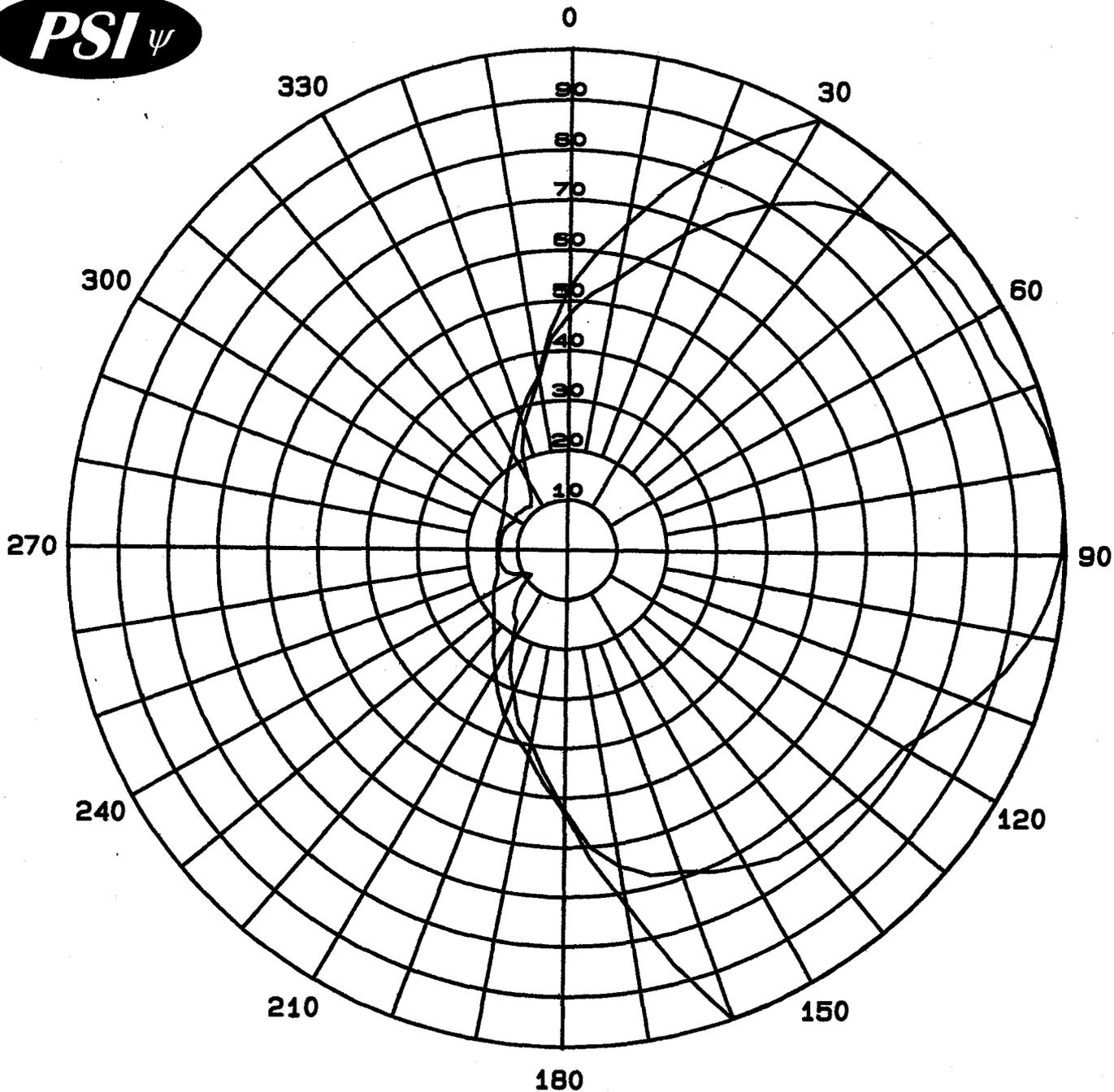
Station: WJKI-Aux

Frequency: 103.5 MHz

Location: Bethany Beach, DE

Maximum ERP: 4.3 kW (6.33 dBk)

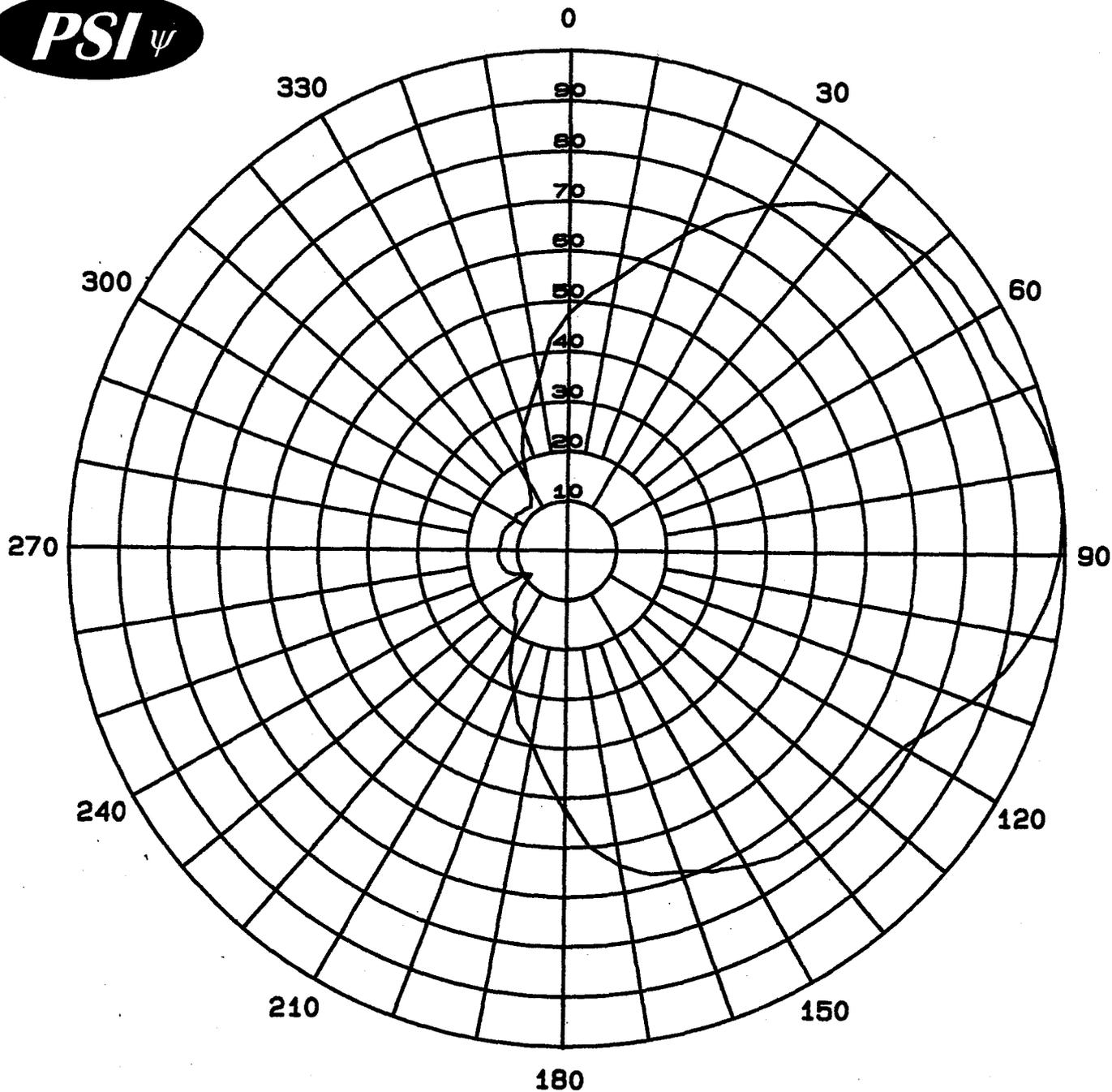
Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.526	1.19	0.75
10	0.662	1.88	2.75
20	0.833	2.98	4.75
30	1.000	4.30	6.33
40	1.000	4.30	6.33
50	1.000	4.30	6.33
60	1.000	4.30	6.33
70	1.000	4.30	6.33
80	1.000	4.30	6.33
90	1.000	4.30	6.33
100	1.000	4.30	6.33
110	1.000	4.30	6.33
120	1.000	4.30	6.33
130	1.000	4.30	6.33
140	1.000	4.30	6.33
150	1.000	4.30	6.33
160	1.000	4.30	6.33
170	0.723	2.25	3.52
180	0.526	1.19	0.75
190	0.418	0.75	-1.24
200	0.353	0.54	-2.71
210	0.281	0.34	-4.69
220	0.222	0.21	-6.74
230	0.188	0.15	-8.18
240	0.167	0.12	-9.21
250	0.146	0.09	-10.38
260	0.140	0.08	-10.74
270	0.140	0.08	-10.74
280	0.140	0.08	-10.74
290	0.140	0.08	-10.74
300	0.146	0.09	-10.38
310	0.161	0.11	-9.53
320	0.188	0.15	-8.18
330	0.222	0.21	-6.74
340	0.281	0.34	-4.69
350	0.353	0.54	-2.71



Maximum Envelope and
Composite Pattern
Antenna: PSIFM-2C-DA
Type: 2-Bay Directional FM Antenna
ERP: 4.3 kW (6.33 dBk)
RMS Envelope: .689
RMS Composite: .600
Frequency: 103.5 MHz

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

WJKI-Aux Bethany Beach, DE



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFM-2C-DA
Type: 2-Bay Directional FM Antenna
ERP: 4.3 kW (6.33 dBk)
RMS Composite: .600
Frequency: 103.5 MHz
WJKI-Aux Bethany Beach, DE

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFM-2C-DA

Great Scott Broadcasting

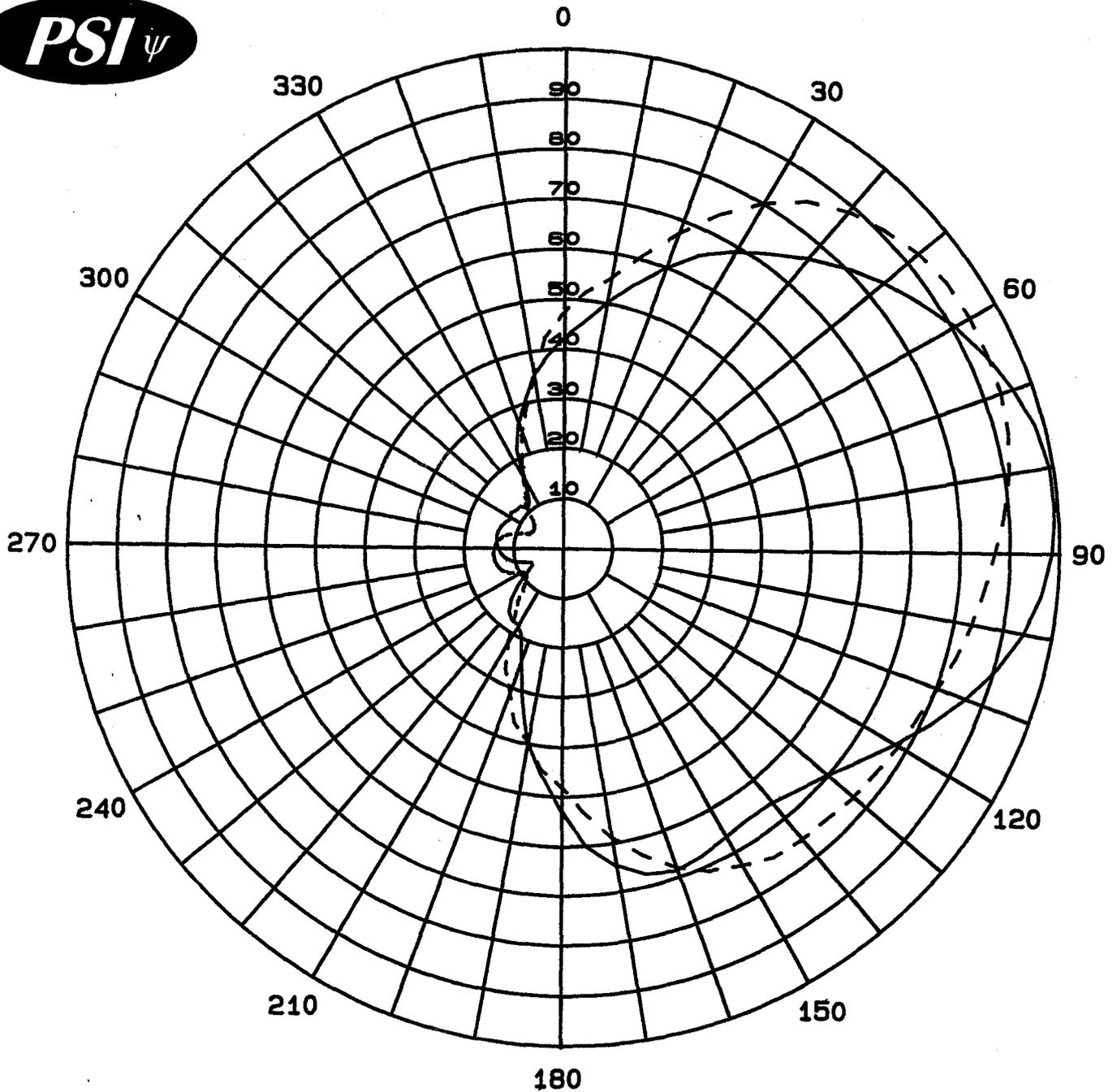
Station: WJKI-Aux

Frequency: 103.5 MHz

Location: Bethany Beach, DE

Maximum ERP: 4.3 kW (6.33 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.474	0.97	-0.15
10	0.552	1.31	1.17
20	0.674	1.95	2.91
30	0.803	2.77	4.43
40	0.890	3.41	5.32
50	0.932	3.74	5.72
60	0.945	3.84	5.84
70	0.966	4.01	6.03
80	0.999	4.29	6.33
90	0.992	4.23	6.26
100	0.948	3.86	5.87
110	0.869	3.25	5.12
120	0.784	2.64	4.22
130	0.769	2.54	4.05
140	0.756	2.46	3.91
150	0.731	2.30	3.61
160	0.688	2.04	3.09
170	0.646	1.79	2.54
180	0.525	1.19	0.74
190	0.392	0.66	-1.80
200	0.304	0.40	-4.01
210	0.215	0.20	-7.02
220	0.165	0.12	-9.32
230	0.116	0.06	-12.38
240	0.094	0.04	-14.20
250	0.128	0.07	-11.52
260	0.137	0.08	-10.93
270	0.137	0.08	-10.93
280	0.134	0.08	-11.12
290	0.131	0.07	-11.32
300	0.120	0.06	-12.08
310	0.120	0.06	-12.08
320	0.114	0.06	-12.53
330	0.156	0.10	-9.80
340	0.262	0.30	-5.30
350	0.349	0.52	-2.81



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFM-2C-DA
Type: 2-Bay Directional FM Antenna
Gain H-pol (solid): 2.77 (4.42 dB)
Gain V-pol (dash): 2.47 (3.93 dB)
Frequency: 103.5 MHz
WJKI-Aux Bethany Beach, DE

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFM-2C-DA

Great Scott Broadcasting

Station: WJKI-Aux

Frequency: 103.5 MHz

Location: Bethany Beach, DE

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.421	0.491	-3.09
10	0.499	0.690	-1.61
20	0.598	0.991	-0.04
30	0.691	1.323	1.21
40	0.765	1.621	2.10
50	0.841	1.959	2.92
60	0.911	2.299	3.62
70	0.966	2.585	4.12
80	0.999	2.764	4.42
90	0.992	2.726	4.36
100	0.948	2.489	3.96
110	0.869	2.092	3.21
120	0.777	1.672	2.23
130	0.702	1.365	1.35
140	0.663	1.218	0.86
150	0.667	1.232	0.91
160	0.688	1.311	1.18
170	0.646	1.156	0.63
180	0.525	0.763	-1.17
190	0.392	0.426	-3.71
200	0.233	0.150	-8.23
210	0.176	0.086	-10.66
220	0.165	0.075	-11.23
230	0.116	0.037	-14.29
240	0.067	0.012	-19.05
250	0.082	0.019	-17.30
260	0.114	0.036	-14.44
270	0.128	0.045	-13.43
280	0.134	0.050	-13.03
290	0.131	0.048	-13.23
300	0.120	0.040	-13.99
310	0.120	0.040	-13.99
320	0.105	0.031	-15.15
330	0.143	0.057	-12.47
340	0.262	0.190	-7.21
350	0.349	0.337	-4.72

Maximum Value

Field 1.000
Gain 2.77 (4.42 dB)
Azimuth Bearing 85 degrees

Minimum Field

Field 0.066
Gain .012 (-19.18 dB)
Azimuth Bearing 245 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.474	0.622	-2.06
10	0.552	0.844	-0.74
20	0.674	1.258	1.00
30	0.803	1.786	2.52
40	0.890	2.194	3.41
50	0.932	2.406	3.81
60	0.945	2.474	3.93
70	0.940	2.448	3.89
80	0.915	2.319	3.65
90	0.874	2.116	3.26
100	0.840	1.955	2.91
110	0.806	1.799	2.55
120	0.784	1.703	2.31
130	0.769	1.638	2.14
140	0.756	1.583	2.00
150	0.731	1.480	1.70
160	0.679	1.277	1.06
170	0.586	0.951	-0.22
180	0.477	0.630	-2.00
190	0.392	0.426	-3.71
200	0.304	0.256	-5.92
210	0.215	0.128	-8.93
220	0.136	0.051	-12.90
230	0.093	0.024	-16.21
240	0.094	0.024	-16.11
250	0.128	0.045	-13.43
260	0.137	0.052	-12.84
270	0.137	0.052	-12.84
280	0.126	0.044	-13.57
290	0.092	0.023	-16.30
300	0.069	0.013	-18.80
310	0.071	0.014	-18.55
320	0.114	0.036	-14.44
330	0.156	0.067	-11.71
340	0.242	0.162	-7.90
350	0.344	0.328	-4.84

Maximum Value

Field 0.945
Gain 2.47 (3.93 dB)
Azimuth Bearing 60 degrees

Minimum Field

Field 0.068
Gain .013 (-18.93 dB)
Azimuth Bearing 305 degrees

ERP Tabulation

Antenna: PSIFM-2C-DA

Great Scott Broadcasting

Station: WJKI-Aux

Frequency: 103.5 MHz

Location: Bethany Beach, DE

Maximum ERP: 4.3 kW (6.33 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.421	0.76	-1.18
10	0.499	1.07	0.30
20	0.598	1.54	1.87
30	0.691	2.05	3.12
40	0.765	2.52	4.01
50	0.841	3.04	4.83
60	0.911	3.57	5.53
70	0.966	4.01	6.03
80	0.999	4.29	6.33
90	0.992	4.23	6.26
100	0.948	3.86	5.87
110	0.869	3.25	5.12
120	0.777	2.60	4.14
130	0.702	2.12	3.26
140	0.663	1.89	2.76
150	0.667	1.91	2.82
160	0.688	2.04	3.09
170	0.646	1.79	2.54
180	0.525	1.19	0.74
190	0.392	0.66	-1.80
200	0.233	0.23	-6.32
210	0.176	0.13	-8.76
220	0.165	0.12	-9.32
230	0.116	0.06	-12.38
240	0.067	0.02	-17.14
250	0.082	0.03	-15.39
260	0.114	0.06	-12.53
270	0.128	0.07	-11.52
280	0.134	0.08	-11.12
290	0.131	0.07	-11.32
300	0.120	0.06	-12.08
310	0.120	0.06	-12.08
320	0.105	0.05	-13.24
330	0.143	0.09	-10.56
340	0.262	0.30	-5.30
350	0.349	0.52	-2.81

Maximum Value (H-pol)

Field 1.000
ERP 4.3 kW (6.33 dBk)

Azimuth Bearing 85 degrees

Minimum Field (H-pol)

Field 0.066
ERP .019 kW (-17.27 dBk)

Azimuth Bearing 245 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.474	0.97	-0.15
10	0.552	1.31	1.17
20	0.674	1.95	2.91
30	0.803	2.77	4.43
40	0.890	3.41	5.32
50	0.932	3.74	5.72
60	0.945	3.84	5.84
70	0.940	3.80	5.80
80	0.915	3.60	5.56
90	0.874	3.28	5.16
100	0.840	3.03	4.82
110	0.806	2.79	4.46
120	0.784	2.64	4.22
130	0.769	2.54	4.05
140	0.756	2.46	3.91
150	0.731	2.30	3.61
160	0.679	1.98	2.97
170	0.586	1.48	1.69
180	0.477	0.98	-0.09
190	0.392	0.66	-1.80
200	0.304	0.40	-4.01
210	0.215	0.20	-7.02
220	0.136	0.08	-10.99
230	0.093	0.04	-14.30
240	0.094	0.04	-14.20
250	0.128	0.07	-11.52
260	0.137	0.08	-10.93
270	0.137	0.08	-10.93
280	0.126	0.07	-11.66
290	0.092	0.04	-14.39
300	0.069	0.02	-16.89
310	0.071	0.02	-16.64
320	0.114	0.06	-12.53
330	0.156	0.10	-9.80
340	0.242	0.25	-5.99
350	0.344	0.51	-2.93

Maximum Value (V-pol)

Field 0.945
ERP 3.84 kW (5.84 dBk)

Azimuth Bearing 60 degrees

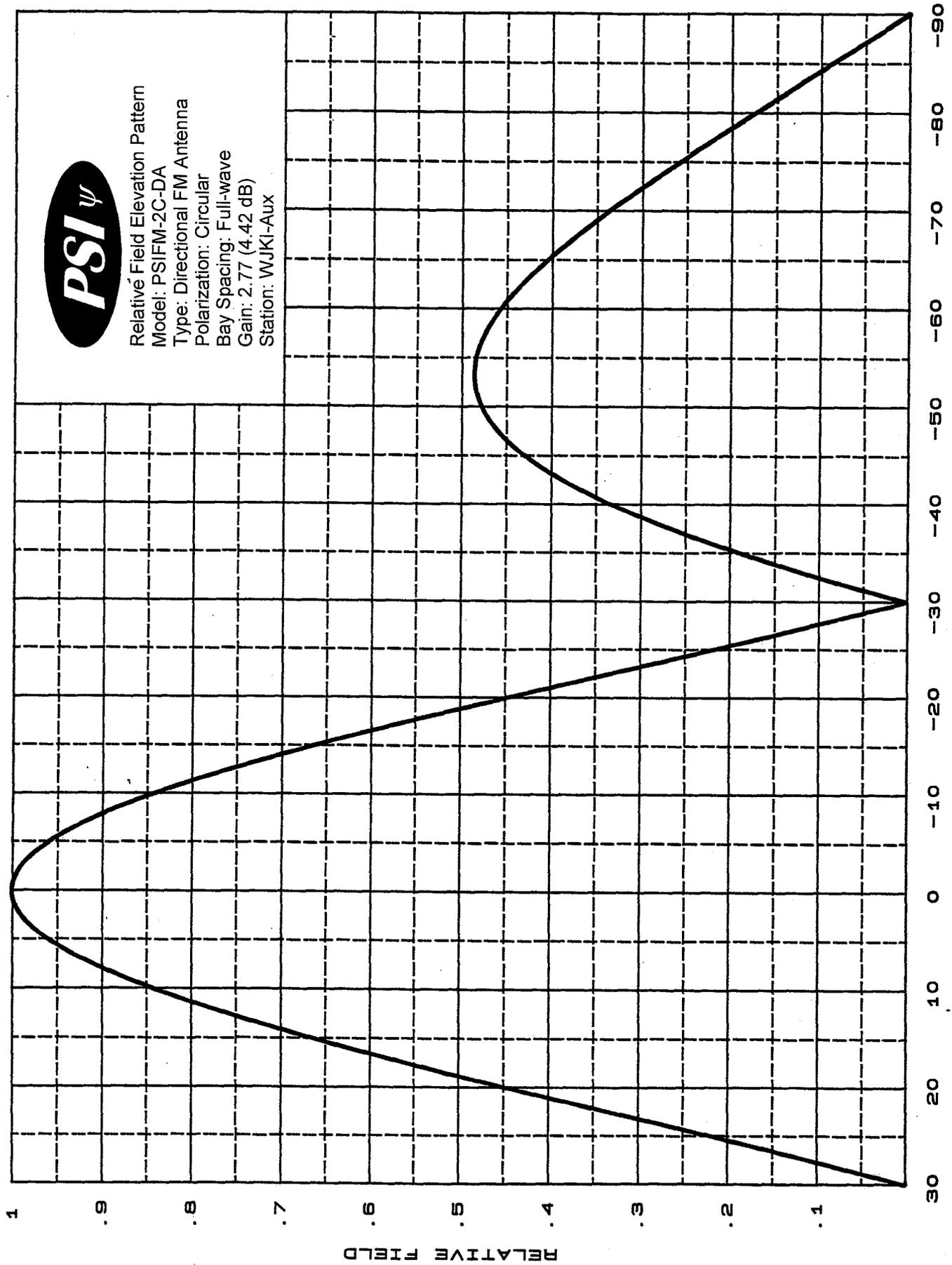
Minimum Field (V-pol)

Field 0.068
ERP .020 kW (-17.02 dBk)

Azimuth Bearing 305 degrees



Relative Field Elevation Pattern
Model: PSIFM-2C-DA
Type: Directional FM Antenna
Polarization: Circular
Bay Spacing: Full-wave
Gain: 2.77 (4.42 dB)
Station: WJKI-Aux



DEGREES BELOW HORIZONTAL

October 13, 2015

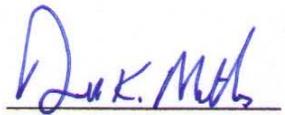
Terry J. Dalton
Project Manager
Stellar Communication Systems, LLC
31003 Country Gardens, Suite L-1
Dagsboro, DE 19939

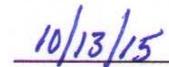
RE: WJKI Tower, Millsboro

To whom it may concern:

I hereby certify that the subject antenna is facing due East (90 degrees East of true North) as shown on the drawing no. 1496-002 of Propagation Systems, Inc.

An initial baseline was set up near the tower using NGS control for GPS stations. Four stations were utilized for an accurate trigonometric analysis of the base line. Topcon's program, Topcon Tools v8.2.3 was used for the computations.


Donald K. Miller, PLS 407


Date

Engineers Statement

October 13, 2015

The undersigned certifies that the Auxiliary directional antenna for WJKI Channel 278A Bethany Beach, Delaware was assembled and installed while under his direct supervision in a manner entirely consistent with Manufacturer's instructions.



Terry J. Dalton
Director of Engineering
Great Scott Broadcasting
31003 Country Gardens Suite L-1
Dagsboro, DE 19939
(302) 245-3550