



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

Directional FM Antenna

WYGG

Minority Business & Housing Development, Inc.

Asbury Park, NJ

July 30, 2018

A custom designed model PSIFLV-2A-DA, a vertical polarized dipole antenna, was used in conjunction with the customer's support mast and triangular tower to create the necessary directional radiation pattern. The final antenna consists of two radiating elements each with two parasitic elements. The dipole radiator attaches to a support mast with an integral mounting bracket that was pre-attached at the factory.

Pattern testing was performed using a 1/3 scale model element and tower. The vertically polarized 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 mounting structure 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 264.3 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 90.4% of the envelope RMS.

The antenna is to be mounted in accordance with the supplied instructions and drawings. The antenna center of radiation approved in the construction permit is 147.6 ft. (45 meters) above ground level. The antenna is to be positioned 60 degrees true. 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.

Exhibit 9 Page 2
Antenna Proof



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

General Specifications

Antenna Model	PSIFLV-2A-DA
Type	2-bay custom directional FM antenna
Polarization	Vertical/Mixed
Frequency	88.1 MHz
Gain (V-pol)	3.87 (5.88 dB)
Gain (H-pol)	.004 (-23.75 dB)
RMS (V-pol)	.700
RMS Envelope	.774
ERP (V-pol)	.78 kW (-1.08 dBk)
ERP (H-pol)	.001 kW (-30.0 dBk)
Input	7/8" EIA
Power rating	1500 Watts
Input power	.202 kW
Length	14.88 ft.
Weight	154 lbs.
Wind Area	9.71 sq-ft

Statement of Certification

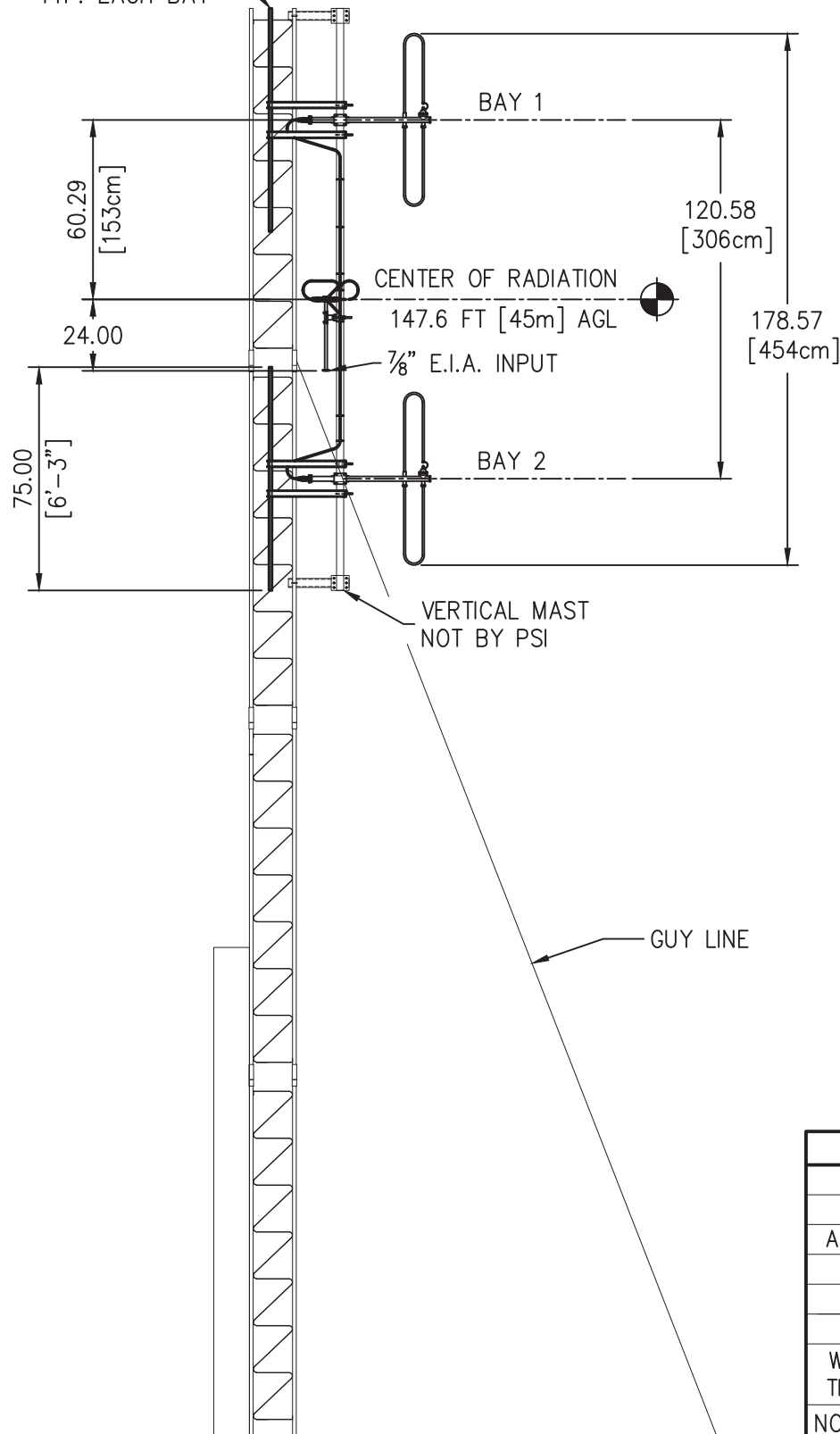
This is to certify the antenna has been designed, fabricated and tested under my supervision and it meets the required envelope pattern limitations set forth in the stations construction permit.

A handwritten signature in black ink, appearing to read "Douglas A. Ross".

Douglas A. Ross
President
Propagation Systems Inc.

Exhibit 9 Page 3
Antenna Proof

PARASITIC ELEMENT
J509FM-768-008
TYP. EACH BAY



SPECIFICATIONS	
SPACING:	0.9λ
LENGTH:	14.88 Ft [4.54m]
APERTURE:	10.05 Ft [3.06m]
RATING:	1500 W
GAIN:	3.87 (5.88 dB)
WEIGHT:	153.6 Lb [69.8 Kg]
WINDAREA:	9.71 Ft ²
TIA-222-F	(NO ICE)
NOTE:	
1. REF. J509FM-768-011 FOR ASSEMBLY DETAILS	

B	M. MOCK	07/30/18	REVISE RADIATION CENTER ABOVE GROUND LEVEL, WAS 40 M (131.2 FT) NOW 45 M (147.6 FT)
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

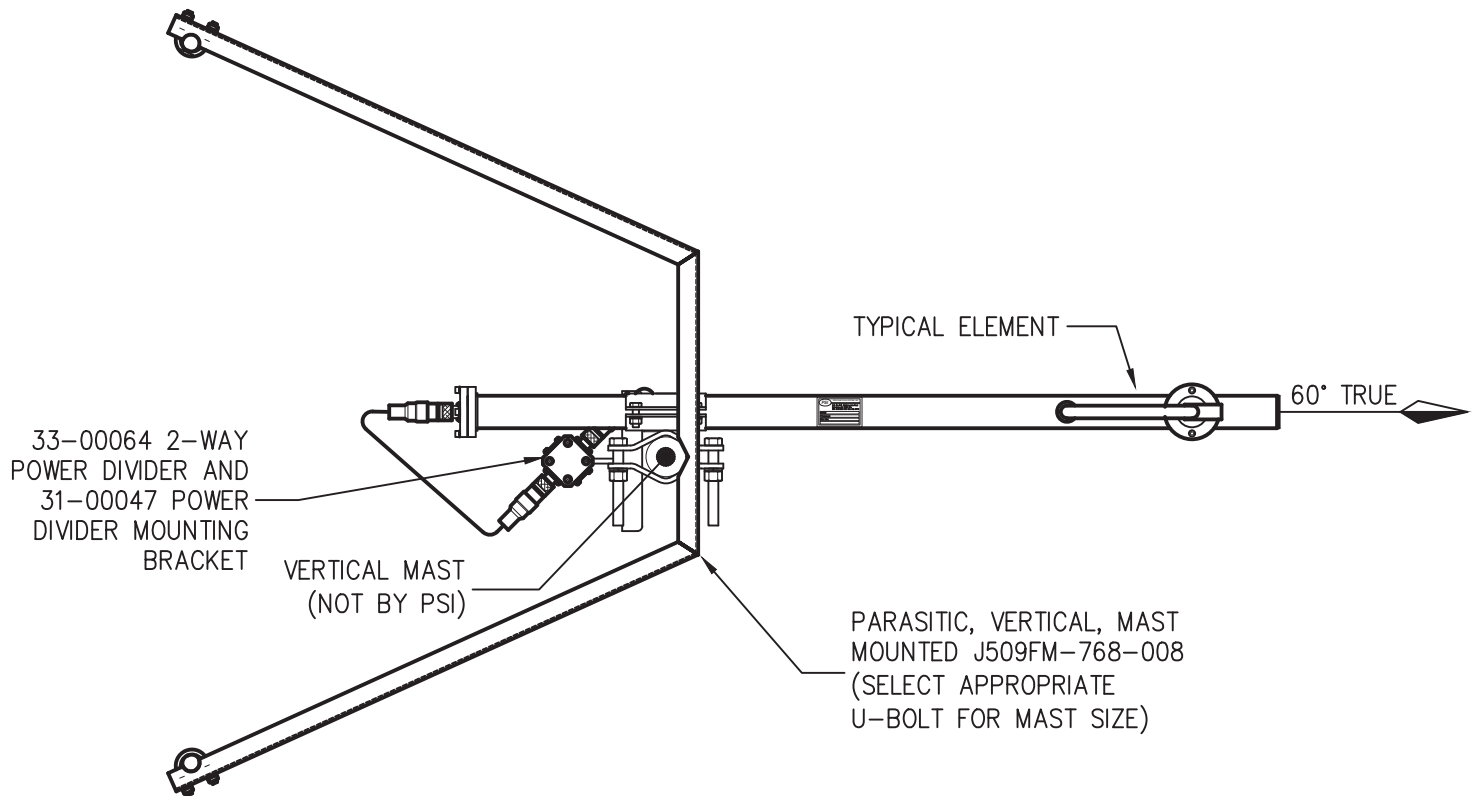
A

PROPAGATION SYSTEMS, INC.
Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATIONS AND SPECIFICATIONS			
MODEL:	PSIFLV-2A-DA	DRAWN BY:	D.G. Kellar
CHANNEL/ FREQUENCY:	88.1 MHz	APPROVED BY:	
SCALE:	1:60	DRAWING NO.:	J509FM-768-001
			REV. B

Exhibit 9 Page 4

Antenna Proof



B	M.MOCK	07/30/18	REVISE RADIATION CENTER ABOVE GROUND LEVEL, WAS 40 M (131.2 FT) NOW 45 M (147.6 FT)
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.

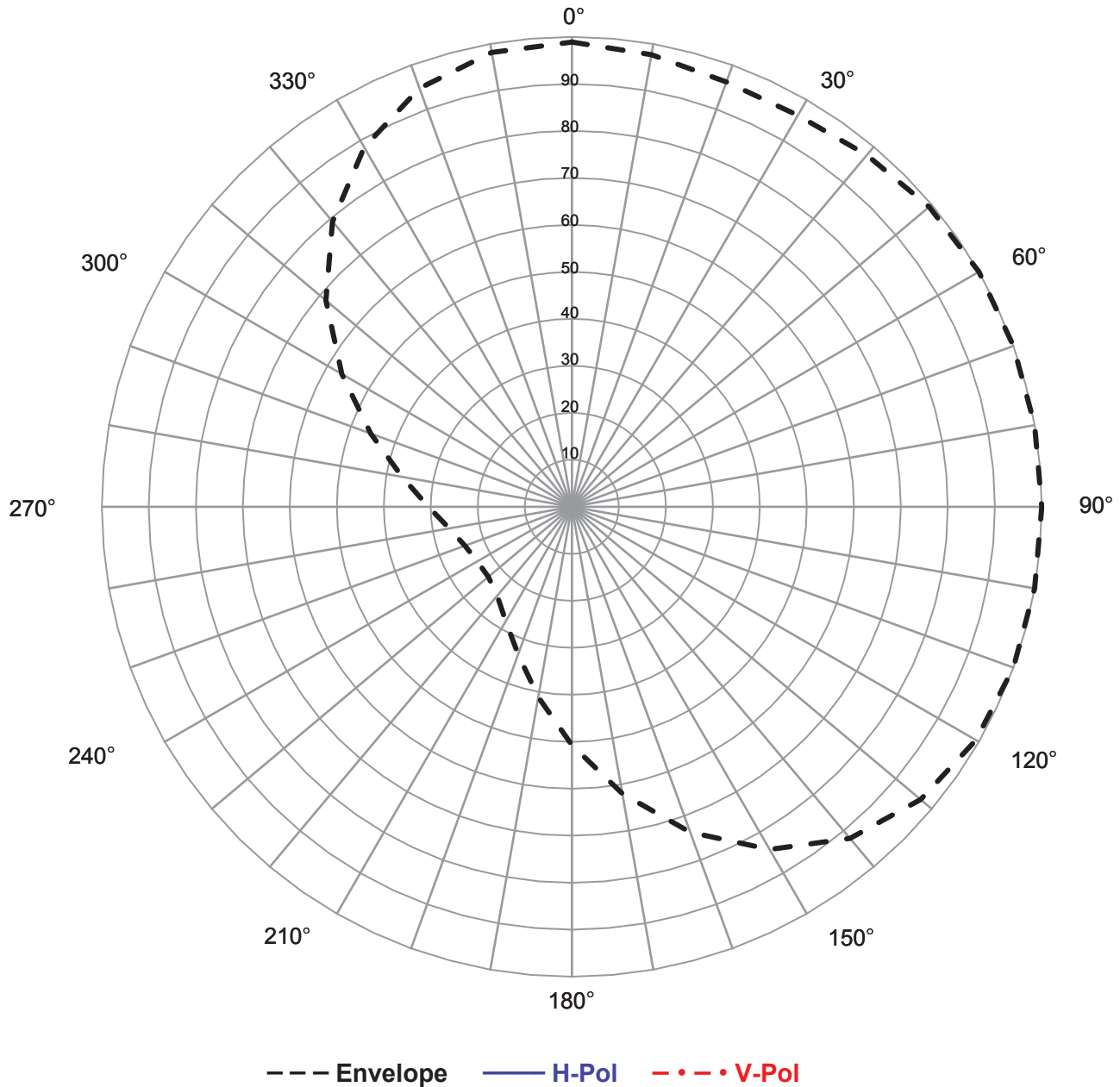
Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA PLANVIEW AND ORIENTATION

MODEL:	PSIFLV-2A-DA	DRAWN BY:	D.G. Kellar	DATE:	7/09/09
CHANNEL/ FREQUENCY:	88.1 MHz	APPROVED BY:		DATE:	
SCALE:	1:10	DRAWING NO.:	J509FM-768-002	REV.	B



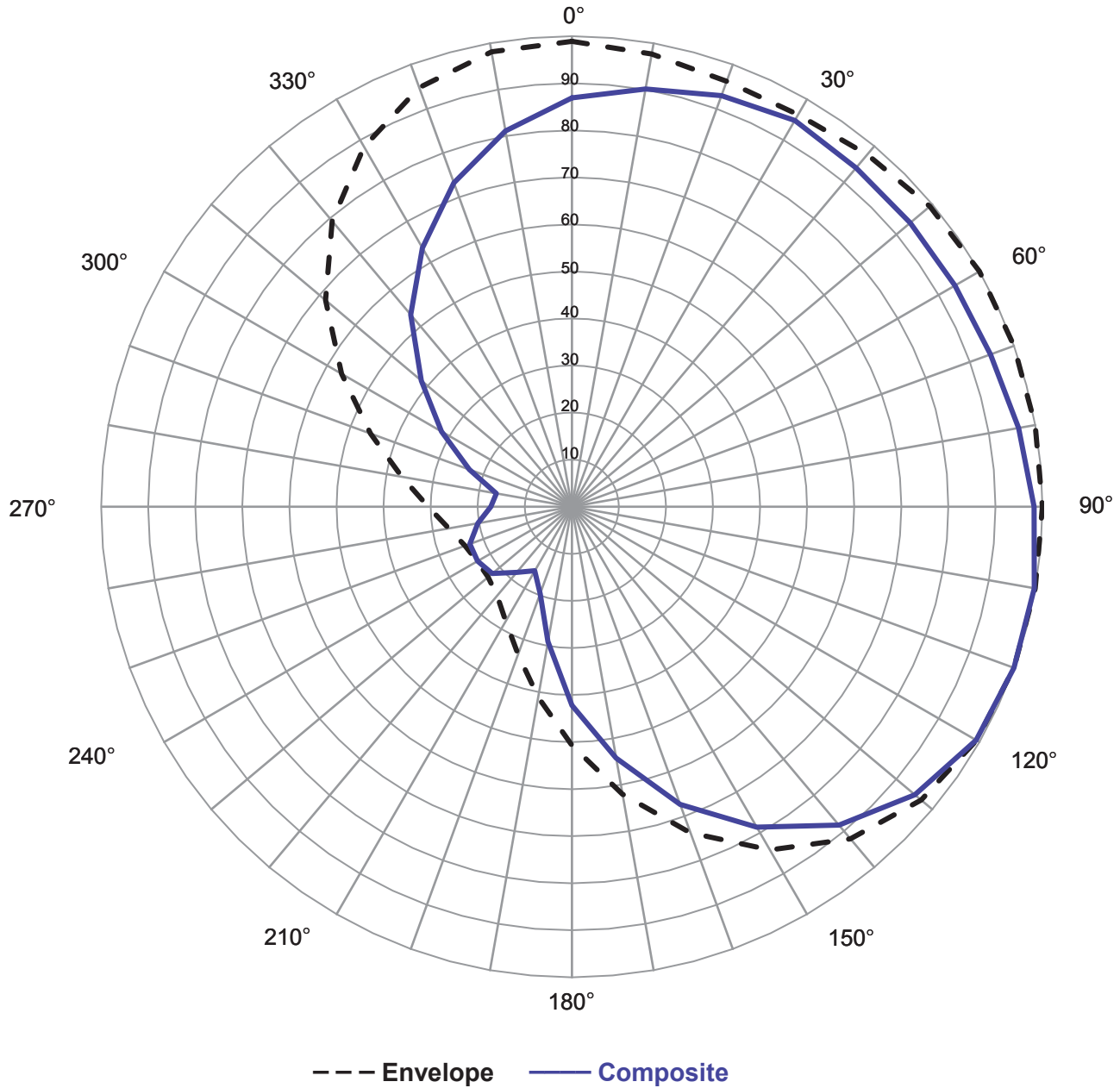
Relative Field
Azimuth Plane Pattern



Pattern Type:	Maximum Envelope	Type:	Directional FM
Antenna Model:	PSIFLV-2A-DA	Bays:	2
Polarization:	Vertical/mixed	Spacing:	9/10-Wavelength
RMS	0.774	Reference:	WYGG
Frequency	88.1 MHz	Date:	7/30/2018



Relative Field
Azimuth Plane Pattern



Pattern Type:	Composite Pattern	Type:	Directional FM
Antenna Model:	PSIFLV-2A-DA	Bays:	2
Polarization:	Vertical/mixed	Spacing:	9/10-Wavelength
RMS (envelope):	0.774	Reference:	WYGG
RMS (composite):	0.700	Date:	7/30/2018

Exhibit 9 Page 7

Antenna Proof

Maximum Envelope Tabulation

Antenna: PSIFLV-2A-DA

Minority Business & Housing Development, Inc.

Station: WYGG

Frequency: 88.1 MHz

Location: Asbury Park, NJ

Maximum Vertical ERP: .78 kW (-1.08 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.989	0.763	-1.18
10	0.977	0.745	-1.28
20	0.962	0.722	-1.42
30	0.962	0.722	-1.42
40	0.977	0.745	-1.28
50	0.993	0.769	-1.14
60	1.000	0.780	-1.08
70	1.000	0.780	-1.08
80	1.000	0.780	-1.08
90	1.000	0.780	-1.08
100	1.000	0.780	-1.08
110	1.000	0.780	-1.08
120	0.993	0.769	-1.14
130	0.969	0.732	-1.35
140	0.921	0.662	-1.79
150	0.842	0.553	-2.57
160	0.737	0.424	-3.73
170	0.620	0.300	-5.23
180	0.507	0.200	-6.98
190	0.411	0.132	-8.80
200	0.334	0.087	-10.60
210	0.281	0.062	-12.10
220	0.247	0.048	-13.23
230	0.232	0.042	-13.77
240	0.232	0.042	-13.77
250	0.242	0.046	-13.40
260	0.265	0.055	-12.61
270	0.305	0.073	-11.39
280	0.367	0.105	-9.79
290	0.455	0.161	-7.92
300	0.565	0.249	-6.04
310	0.683	0.364	-4.39
320	0.792	0.489	-3.10
330	0.883	0.608	-2.16
340	0.948	0.701	-1.54
350	0.982	0.752	-1.24

Exhibit 9 Page 8

Antenna Proof

Composite Pattern Tabulation

Antenna: PSIFLV-2A-DA

Minority Business & Housing Development, Inc.

Station: WYGG

Frequency: 88.1 MHz

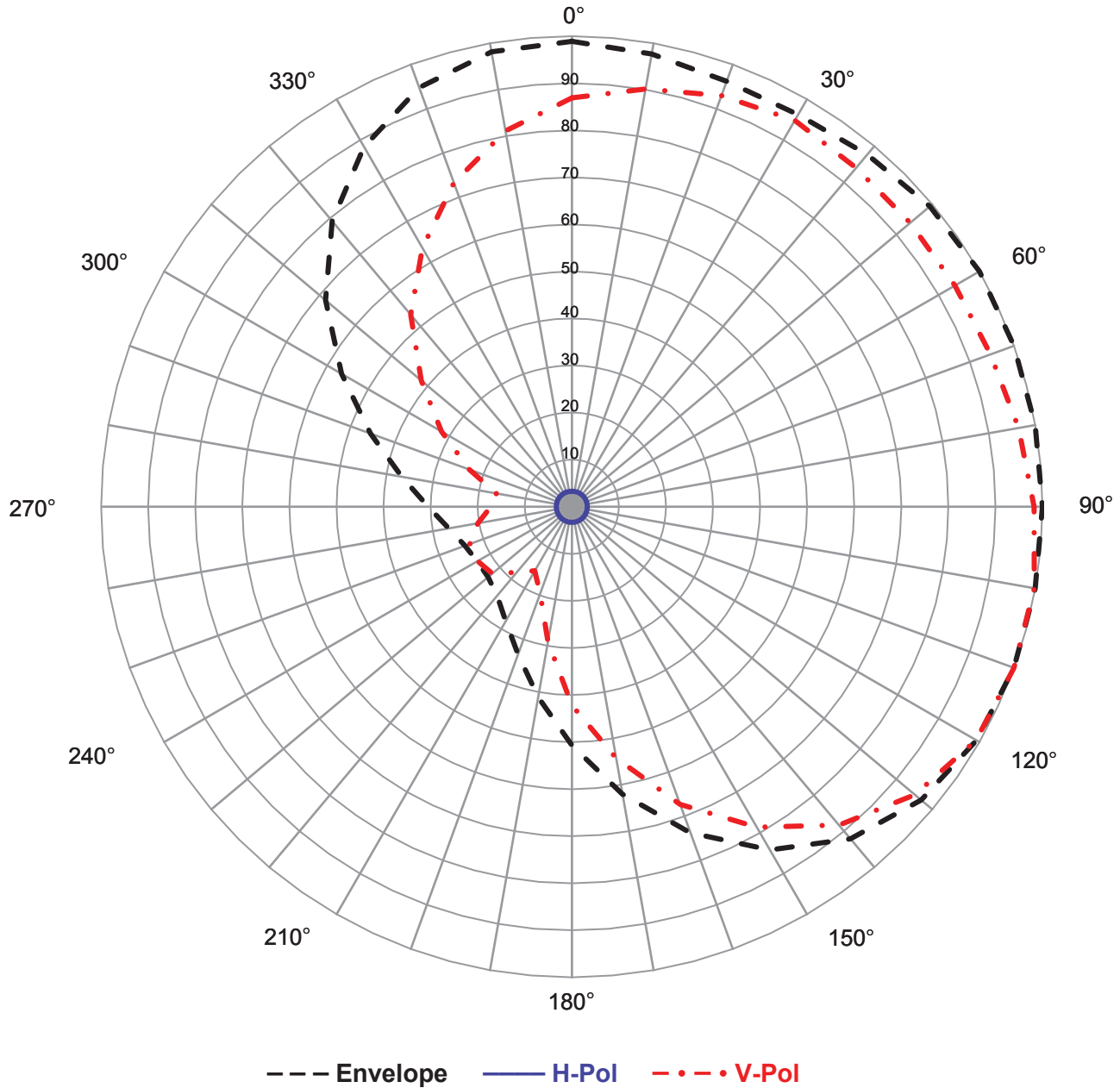
Location: Asbury Park, NJ

Maximum Vertical ERP: .78 kW (-1.08 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.869	0.589	-2.30
10	0.901	0.634	-1.98
20	0.930	0.674	-1.71
30	0.948	0.701	-1.54
40	0.940	0.689	-1.62
50	0.938	0.687	-1.63
60	0.940	0.689	-1.62
70	0.946	0.699	-1.56
80	0.964	0.725	-1.40
90	0.982	0.753	-1.23
100	0.998	0.777	-1.10
110	1.000	0.780	-1.08
120	0.992	0.768	-1.15
130	0.952	0.706	-1.51
140	0.883	0.608	-2.16
150	0.786	0.482	-3.17
160	0.673	0.353	-4.52
170	0.542	0.229	-6.40
180	0.422	0.139	-8.57
190	0.291	0.066	-11.80
200	0.197	0.030	-15.19
210	0.157	0.019	-17.15
220	0.182	0.026	-15.87
230	0.221	0.038	-14.21
240	0.231	0.042	-13.81
250	0.231	0.042	-13.81
260	0.203	0.032	-14.95
270	0.172	0.023	-16.37
280	0.163	0.021	-16.84
290	0.232	0.042	-13.78
300	0.320	0.080	-10.98
310	0.417	0.136	-8.67
320	0.532	0.221	-6.55
330	0.635	0.315	-5.02
340	0.732	0.418	-3.78
350	0.811	0.513	-2.90



Relative Field
Azimuth Plane Pattern



Pattern Type:	Relative Field	Type:	Directional FM
Antenna Model:	PSIFLV-2A-DA	Bays:	2
Polarization:	Vertical/mixed	Spacing:	9/10-Wavelength
Gain:	3.87 (5.88 dB)	Reference:	WYGG
Frequency:	88.1 MHz	Date:	7/30/2018

Exhibit 9 Page 10

Antenna Proof

Relative Field Tabulation

Antenna: PSIFLV-2A-DA
 Minority Business & Housing Development, Inc.
 Station: WYGG
 Frequency: 88.1 MHz
 Location: Asbury Park, NJ

Calculated Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.033	0.004	-23.75
10	0.033	0.004	-23.75
20	0.033	0.004	-23.75
30	0.033	0.004	-23.75
40	0.033	0.004	-23.75
50	0.033	0.004	-23.75
60	0.033	0.004	-23.75
70	0.033	0.004	-23.75
80	0.033	0.004	-23.75
90	0.033	0.004	-23.75
100	0.033	0.004	-23.75
110	0.033	0.004	-23.75
120	0.033	0.004	-23.75
130	0.033	0.004	-23.75
140	0.033	0.004	-23.75
150	0.033	0.004	-23.75
160	0.033	0.004	-23.75
170	0.033	0.004	-23.75
180	0.033	0.004	-23.75
190	0.033	0.004	-23.75
200	0.033	0.004	-23.75
210	0.033	0.004	-23.75
220	0.033	0.004	-23.75
230	0.033	0.004	-23.75
240	0.033	0.004	-23.75
250	0.033	0.004	-23.75
260	0.033	0.004	-23.75
270	0.033	0.004	-23.75
280	0.033	0.004	-23.75
290	0.033	0.004	-23.75
300	0.033	0.004	-23.75
310	0.033	0.004	-23.75
320	0.033	0.004	-23.75
330	0.033	0.004	-23.75
340	0.033	0.004	-23.75
350	0.033	0.004	-23.75

Maximum Value

Field 0.033
 Gain .004 (-23.75 dB)

Measured Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.869	2.92	4.66
10	0.901	3.14	4.98
20	0.930	3.34	5.24
30	0.948	3.48	5.41
40	0.940	3.42	5.34
50	0.938	3.41	5.32
60	0.940	3.42	5.34
70	0.946	3.47	5.40
80	0.964	3.60	5.56
90	0.982	3.73	5.72
100	0.998	3.85	5.86
110	1.000	3.87	5.88
120	0.992	3.81	5.81
130	0.952	3.51	5.45
140	0.883	3.02	4.80
150	0.786	2.39	3.79
160	0.673	1.75	2.44
170	0.542	1.14	0.56
180	0.422	0.69	-1.61
190	0.291	0.33	-4.85
200	0.197	0.15	-8.23
210	0.157	0.10	-10.20
220	0.182	0.13	-8.92
230	0.221	0.19	-7.25
240	0.231	0.21	-6.85
250	0.231	0.21	-6.86
260	0.203	0.16	-7.99
270	0.172	0.11	-9.42
280	0.163	0.10	-9.88
290	0.232	0.21	-6.83
300	0.320	0.40	-4.02
310	0.417	0.67	-1.72
320	0.532	1.10	0.40
330	0.635	1.56	1.93
340	0.732	2.08	3.17
350	0.811	2.55	4.06

Maximum Field (V-pol)

Field 1.00
 Gain 3.87 (5.88 dB)
 Azimuth Bearing 110 degrees

Minimum Field (V-pol)

Field 0.157
 Gain .10 (-10.20 dB)
 Azimuth Bearing 210 degrees

Exhibit 9 Page 11

Antenna Proof

ERP Tabulation

Antenna: PSIFLV-2A-DA
Minority Business & Housing Development, Inc.
Station: WYGG
Frequency: 88.1 MHz
Location: Asbury Park, NJ
Maximum Vertical ERP: .78 kW (-1.08 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.033	0.001	-30.71
10	0.033	0.001	-30.71
20	0.033	0.001	-30.71
30	0.033	0.001	-30.71
40	0.033	0.001	-30.71
50	0.033	0.001	-30.71
60	0.033	0.001	-30.71
70	0.033	0.001	-30.71
80	0.033	0.001	-30.71
90	0.033	0.001	-30.71
100	0.033	0.001	-30.71
110	0.033	0.001	-30.71
120	0.033	0.001	-30.71
130	0.033	0.001	-30.71
140	0.033	0.001	-30.71
150	0.033	0.001	-30.71
160	0.033	0.001	-30.71
170	0.033	0.001	-30.71
180	0.033	0.001	-30.71
190	0.033	0.001	-30.71
200	0.033	0.001	-30.71
210	0.033	0.001	-30.71
220	0.033	0.001	-30.71
230	0.033	0.001	-30.71
240	0.033	0.001	-30.71
250	0.033	0.001	-30.71
260	0.033	0.001	-30.71
270	0.033	0.001	-30.71
280	0.033	0.001	-30.71
290	0.033	0.001	-30.71
300	0.033	0.001	-30.71
310	0.033	0.001	-30.71
320	0.033	0.001	-30.71
330	0.033	0.001	-30.71
340	0.033	0.001	-30.71
350	0.033	0.001	-30.71

Maximum Value (H-pol)

Field 0.03
ERP .001 kW (-30.0 dBk)

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.869	0.589	-2.30
10	0.901	0.634	-1.98
20	0.930	0.674	-1.71
30	0.948	0.701	-1.54
40	0.940	0.689	-1.62
50	0.938	0.687	-1.63
60	0.940	0.689	-1.62
70	0.946	0.699	-1.56
80	0.964	0.725	-1.40
90	0.982	0.753	-1.23
100	0.998	0.777	-1.10
110	1.000	0.780	-1.08
120	0.992	0.768	-1.15
130	0.952	0.706	-1.51
140	0.883	0.608	-2.16
150	0.786	0.482	-3.17
160	0.673	0.353	-4.52
170	0.542	0.229	-6.40
180	0.422	0.139	-8.57
190	0.291	0.066	-11.80
200	0.197	0.030	-15.19
210	0.157	0.019	-17.15
220	0.182	0.026	-15.87
230	0.221	0.038	-14.21
240	0.231	0.042	-13.81
250	0.231	0.042	-13.81
260	0.203	0.032	-14.95
270	0.172	0.023	-16.37
280	0.163	0.021	-16.84
290	0.232	0.042	-13.78
300	0.320	0.080	-10.98
310	0.417	0.136	-8.67
320	0.532	0.221	-6.55
330	0.635	0.315	-5.02
340	0.732	0.418	-3.78
350	0.811	0.513	-2.90

Maximum Value (V-pol)

Field 1.00
ERP .780 kW (-1.079 dBk)
Azimuth Bearing 110 degrees

Minimum Field (V-pol)

Field 0.157
ERP .019 kW (-17.15 dBk)
Azimuth Bearing 210 degrees



Relative Field Elevation Pattern

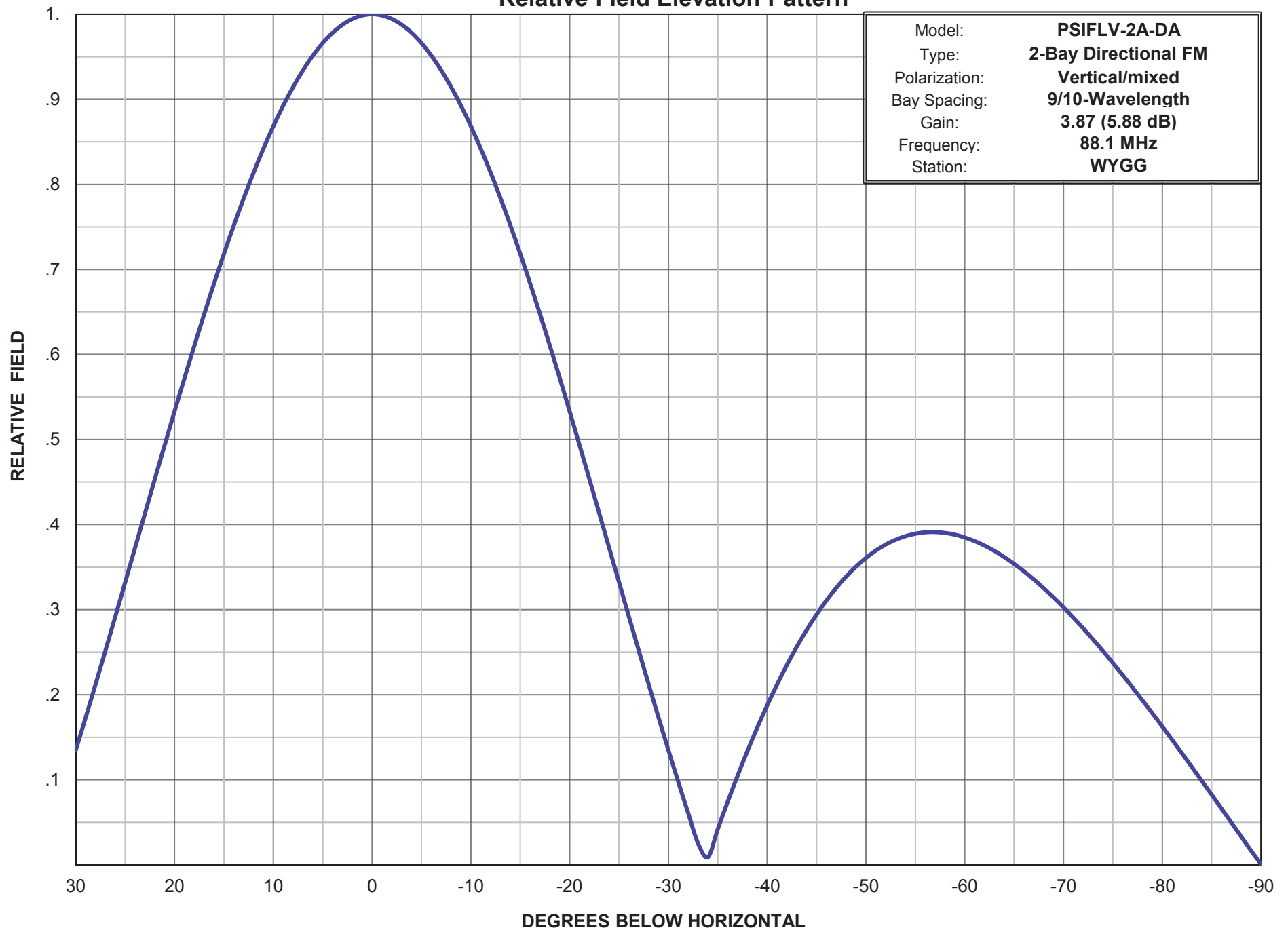


Exhibit 9 Page 13

Antenna Proof



Propagation Systems Inc.

Elevation Pattern Tabulation

Antenna: PSIFLV-2A-DA

Bay spacing: 9/10-Wavelength

Station: WYGG

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90.0	0.001	-60.000	-50.0	0.361	-8.856	-10.0	0.868	-1.226
-89.0	0.017	-35.642	-49.0	0.351	-9.104	-9.0	0.892	-0.989
-88.0	0.033	-29.582	-48.0	0.339	-9.398	-8.0	0.914	-0.777
-87.0	0.050	-26.073	-47.0	0.326	-9.746	-7.0	0.934	-0.592
-86.0	0.066	-23.581	-46.0	0.311	-10.152	-6.0	0.951	-0.434
-85.0	0.083	-21.663	-45.0	0.294	-10.626	-5.0	0.966	-0.300
-84.0	0.099	-20.106	-44.0	0.276	-11.180	-4.0	0.978	-0.192
-83.0	0.115	-18.786	-43.0	0.256	-11.823	-3.0	0.988	-0.109
-82.0	0.131	-17.651	-42.0	0.235	-12.579	-2.0	0.994	-0.049
-81.0	0.147	-16.655	-41.0	0.212	-13.475	-1.0	0.998	-0.013
-80.0	0.163	-15.771	-40.0	0.187	-14.543	0.0	1.000	0.000
-79.0	0.178	-14.983	-39.0	0.161	-15.844	1.0	0.998	-0.013
-78.0	0.193	-14.274	-38.0	0.134	-17.472	2.0	0.994	-0.049
-77.0	0.208	-13.625	-37.0	0.105	-19.614	3.0	0.988	-0.109
-76.0	0.223	-13.033	-36.0	0.074	-22.605	4.0	0.978	-0.192
-75.0	0.237	-12.495	-35.0	0.042	-27.510	5.0	0.966	-0.300
-74.0	0.251	-11.994	-34.0	0.009	-40.974	6.0	0.951	-0.433
-73.0	0.265	-11.540	-33.0	0.025	-31.937	7.0	0.934	-0.592
-72.0	0.278	-11.118	-32.0	0.061	-24.306	8.0	0.914	-0.777
-71.0	0.291	-10.734	-31.0	0.097	-20.227	9.0	0.893	-0.987
-70.0	0.303	-10.379	-30.0	0.135	-17.403	10.0	0.868	-1.226
-69.0	0.314	-10.055	-29.0	0.173	-15.230	11.0	0.842	-1.493
-68.0	0.325	-9.758	-28.0	0.212	-13.462	12.0	0.814	-1.790
-67.0	0.335	-9.487	-27.0	0.252	-11.978	13.0	0.784	-2.118
-66.0	0.345	-9.244	-26.0	0.292	-10.698	14.0	0.752	-2.478
-65.0	0.354	-9.025	-25.0	0.332	-9.570	15.0	0.718	-2.873
-64.0	0.362	-8.830	-24.0	0.373	-8.572	16.0	0.684	-3.303
-63.0	0.369	-8.657	-23.0	0.413	-7.677	17.0	0.647	-3.776
-62.0	0.375	-8.512	-22.0	0.453	-6.869	18.0	0.610	-4.289
-61.0	0.381	-8.390	-21.0	0.493	-6.135	19.0	0.572	-4.850
-60.0	0.385	-8.294	-20.0	0.533	-5.462	20.0	0.533	-5.462
-59.0	0.388	-8.219	-19.0	0.572	-4.850	21.0	0.494	-6.132
-58.0	0.390	-8.175	-18.0	0.610	-4.291	22.0	0.454	-6.866
-57.0	0.391	-8.152	-17.0	0.647	-3.776	23.0	0.413	-7.677
-56.0	0.391	-8.158	-16.0	0.683	-3.305	24.0	0.373	-8.572
-55.0	0.389	-8.196	-15.0	0.718	-2.873	25.0	0.332	-9.570
-54.0	0.386	-8.260	-14.0	0.752	-2.478	26.0	0.292	-10.693
-53.0	0.382	-8.356	-13.0	0.784	-2.118	27.0	0.252	-11.973
-52.0	0.377	-8.484	-12.0	0.814	-1.790	28.0	0.212	-13.462
-51.0	0.369	-8.650	-11.0	0.842	-1.494	29.0	0.173	-15.222