

KXWT COMPLIANCE WITH SPECIAL OPERATING CONDITIONS

- Proof of Performance from the antenna manufacturer (PSI) is attached as Exhibit A.
- Licensed surveyor letter is attached as Exhibit B certifying that the antenna is correctly oriented.
- A letter from a qualified engineer, Jim Stanford, is attached as Exhibit C.
- A map demonstrating that the measured pattern properly covers the community of license (Odessa, Texas) is attached as Exhibit D.
- As demonstrated in the manufacturer proof of performance (Exhibit A) a relative maximum field strength of 1.0 is achieved at the azimuth of 150° T and corresponds to an ERP of 40kW.
- Licensee understands that further modification of KVDG (FM), Midland, TX will not be considered as a per se modification of KXWT's facility.



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
KXWT
Marfa Public Radio
Odessa, TX**

A standard model PSIFMR antenna element with custom mounts and parasitic elements was used in conjunction with a model of the customer's 36" face Sabre Industries Tower to create the necessary directional radiation pattern. The final antenna consists of six radiating elements full wavelength spaced with two vertical and one horizontal parasitic element per bay. The antenna array is center fed. 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. All feed cables to the antenna were secured and grounded during pattern measurements. A Hewlett Packard 8753E-network analyzer operating at 273.9 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 94% of the envelope RMS.

The antenna is to be mounted 108 meters (354 ft.) above ground level which is within the allowed tolerance of the approved 108-meter center of radiation in the construction permit. No other antenna can be installed within 10 ft of any radiating element. The antenna is to be mounted to the southwest tower leg and positioned 210° True and certified by a licensed surveyor.



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

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 7.94 kW will be required at the antenna input in order to reach the licensed 40 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.

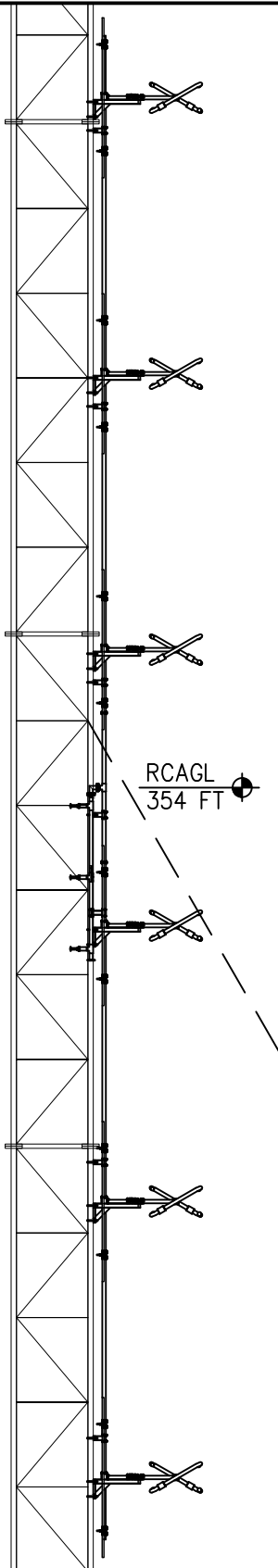
Antenna Specifications

Antenna Model	PSIFMR-6C-DA
Type	6-Bay medium power directional FM antenna
Bay Spacing	Full wavelength spaced elements
Frequency	93.1 MHz
Polarization	Circular
Envelope RMS	.843
Composite RMS	.792
Gain (H-pol)	5.04 (7.02 dB)
Gain (V-pol)	5.04 (7.02 dB)
Input	1-5/8" EIA center fed input
Input power	7.94 kW
Power rating	9 kW
Length	60.1 ft.
Weight	520 lbs.
Wind Area	48.86 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.

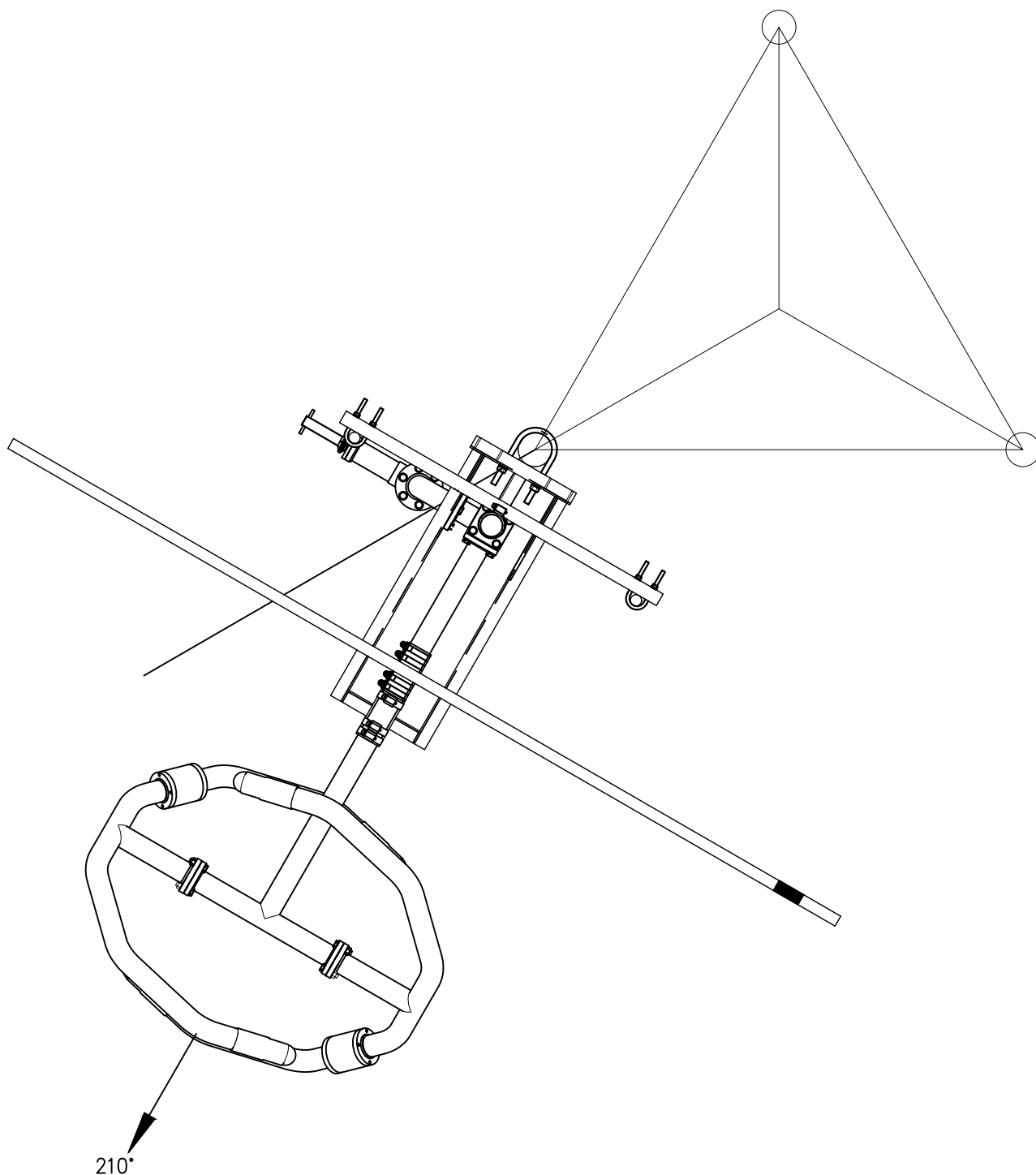
Douglas A. Ross
President
Propagation Systems Inc.



SPECIFICATIONS	
SPACING:	λ
BAY SPACING ('S'):	10.8 FT (3.3 M)
APERTURE ('A'):	53.9 FT (16.4 M)
LENGTH ('L'):	60.1 FT (18.3 M)
RCAGL:	354 FT (108 M)
WEIGHT:	520 LB (235.9 KG)
WIND AREA:	48.86 FT ² (4.5 M ²)
POWER RATING:	9 kW
GAIN:	5.04 (7.02 dB)
POLARIZATION	CIRCULAR
NOTE: 1. WEIGHT AND WIND AREA ARE ESTIMATED. WIND AREA IN ACCORDANCE WITH TIA/EIA-222-F $\Sigma(CaAc)$ 2. TIE WRAP COAX. CABLE AT $\pm 16"$ O.C.	

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 ELEVATION SPECIFICATIONS			
MODEL:	PSIFMR-6C-DA	DRAWN BY:	H.POTTS
CHANNEL/FREQUENCY:	91.3 MHz	APPROVED BY:	
SCALE:		DRAWING NO.:	2113-001
		DATE:	11/18/2020
			Page 4 of 16
		REV.	



PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ORIENTATION DETAILS

MODEL:	PSIFMR-6C-DA	DRAWN BY:	H.POTTS	DATE:	11/18/2020
CHANNEL/ FREQUENCY:	91.3 MHz	APPROVED BY:		DATE:	Page 5 of 16
SCALE:		DRAWING NO.:	2113-002	REV.	

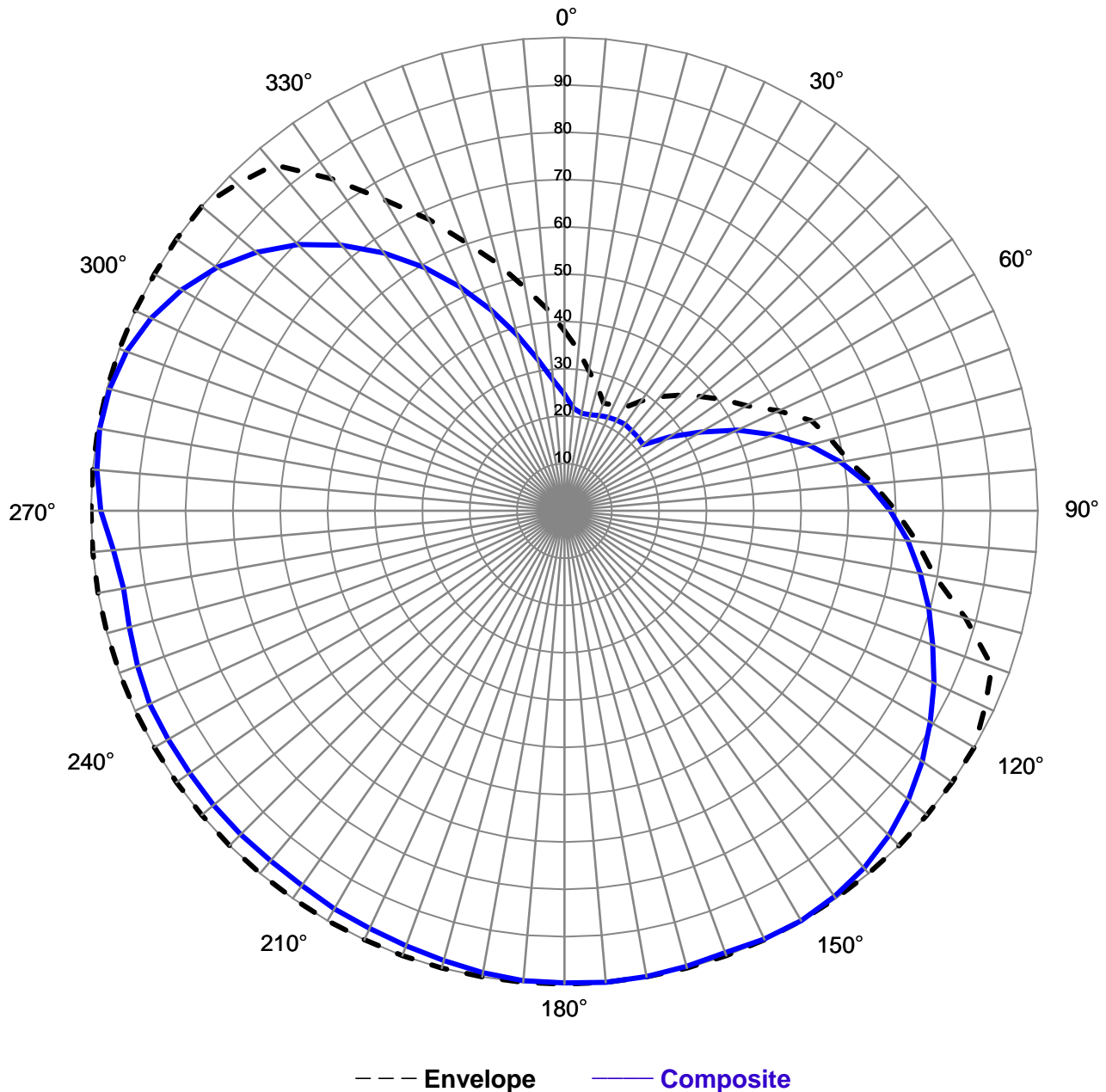
This drawing is loaned subject to the express understanding and agreement that the drawing and information therein contained are, and shall remain the property of PSI, and will not be otherwise utilized or disposed of, directly or indirectly, and will not be used in whole or in part or assist in making 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



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Composite
Antenna Model:	PSIFMR-6C-DA
Polarization:	Circular
RMS (envelope)	0.843
RMS (composite)	0.792

Tower:	Triangular 36" Face
Orientation:	210°
Frequency:	91.3 MHz
Station:	KXWT
Date:	11/5/2020

Maximum Envelope Tabulation

Antenna Model: PSIFMR-6C-DA

Marfa Public Radio

Station: KXWT

Frequency: 91.3 MHz

Location: Odessa, TX

Maximum ERP: 40.0 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.380	5.78	7.62
10	0.300	3.60	5.56
20	0.242	2.34	3.70
30	0.251	2.52	4.01
40	0.316	3.99	6.01
50	0.375	5.63	7.50
60	0.444	7.89	8.97
70	0.556	12.37	10.92
80	0.610	14.88	11.73
90	0.700	19.60	12.92
100	0.794	25.22	14.02
110	0.961	36.94	15.68
120	1.000	40.00	16.02
130	1.000	40.00	16.02
140	1.000	40.00	16.02
150	1.000	40.00	16.02
160	1.000	40.00	16.02
170	1.000	40.00	16.02
180	1.000	40.00	16.02
190	1.000	40.00	16.02
200	1.000	40.00	16.02
210	1.000	40.00	16.02
220	1.000	40.00	16.02
230	1.000	40.00	16.02
240	1.000	40.00	16.02
250	1.000	40.00	16.02
260	1.000	40.00	16.02
270	1.000	40.00	16.02
280	1.000	40.00	16.02
290	1.000	40.00	16.02
300	1.000	40.00	16.02
310	1.000	40.00	16.02
320	0.954	36.40	15.61
330	0.758	22.98	13.61
340	0.602	14.50	11.61
350	0.478	9.14	9.61

Composite Pattern Tabulation

Antenna Model: PSIFMR-6C-DA

Marfa Public Radio

Station: KXWT

Frequency: 91.3 MHz

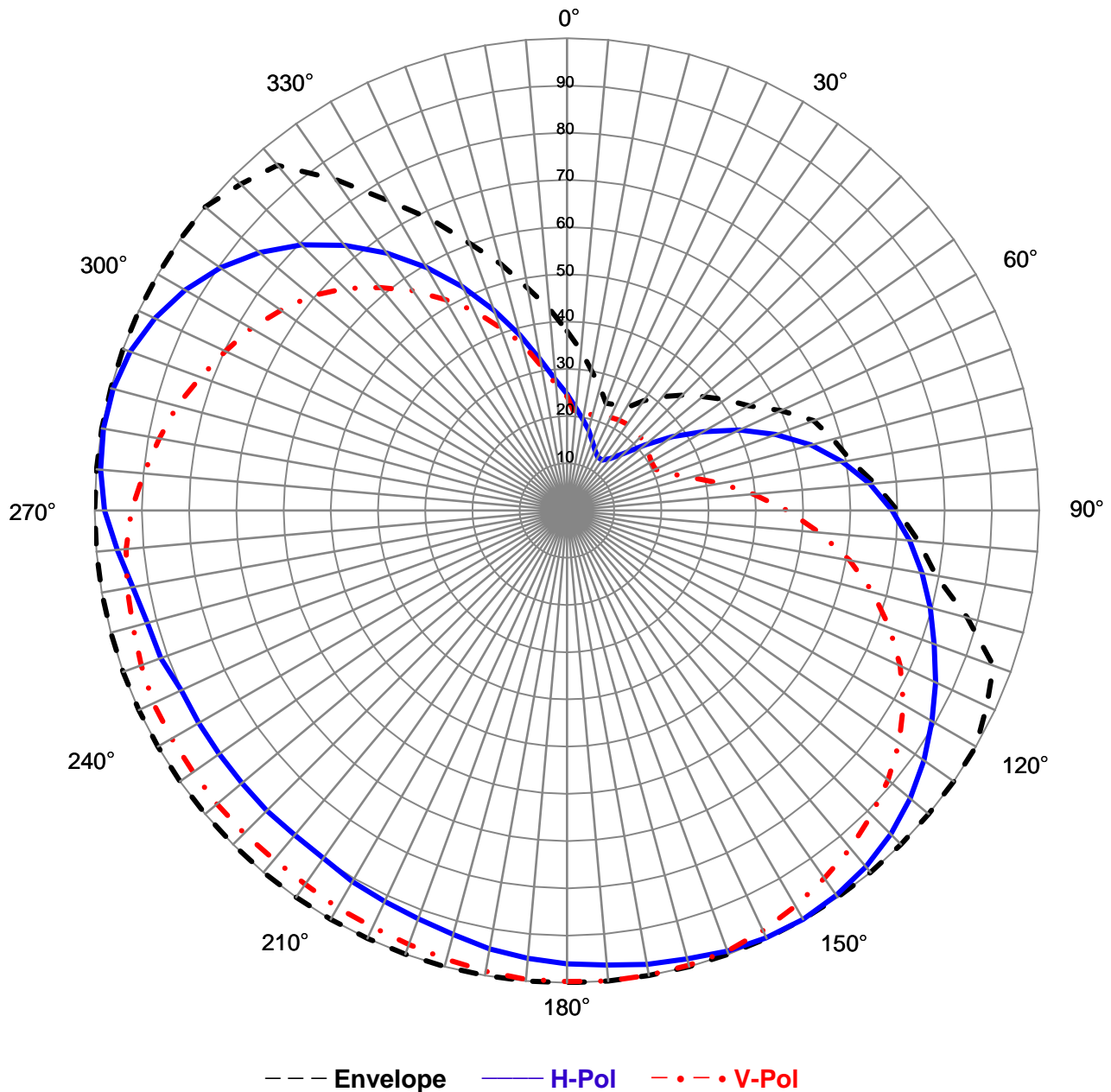
Location: Odessa, TX

Maximum ERP: 40.0 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.246	2.43	3.85
10	0.209	1.75	2.42
20	0.214	1.83	2.63
30	0.221	1.95	2.91
40	0.221	1.95	2.91
50	0.217	1.88	2.75
60	0.333	4.44	6.47
70	0.470	8.83	9.46
80	0.592	14.04	11.47
90	0.688	18.95	12.78
100	0.763	23.31	13.68
110	0.828	27.41	14.38
120	0.892	31.86	15.03
130	0.949	36.00	15.56
140	0.985	38.82	15.89
150	1.000	40.00	16.02
160	0.993	39.45	15.96
170	0.999	39.94	16.01
180	0.997	39.80	16.00
190	0.991	39.29	15.94
200	0.978	38.27	15.83
210	0.971	37.73	15.77
220	0.965	37.28	15.71
230	0.967	37.42	15.73
240	0.966	37.33	15.72
250	0.959	36.81	15.66
260	0.946	35.77	15.53
270	0.979	38.34	15.84
280	0.996	39.72	15.99
290	0.984	38.71	15.88
300	0.934	34.86	15.42
310	0.850	28.87	14.60
320	0.733	21.47	13.32
330	0.594	14.12	11.50
340	0.451	8.15	9.11
350	0.325	4.21	6.25



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Field
Antenna Model:	PSIFMR-6C-DA
Polarization:	Circular
Gain (H-pol):	5.04 (7.02 dB)
Gain (V-pol):	5.04 (7.02 dB)

Tower:	Triangular 36" Face
Orientation:	210°
Configuration:	91.3 MHz
Station:	KXWT
Date:	11/5/2020

Measured Relative Field Tabulation

Antenna Model: PSIFMR-6C-DA

Marfa Public Radio

Station: KXWT

Frequency: 91.3 MHz

Location: Odessa, TX

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.246	0.306	-5.15
10	0.195	0.192	-7.17
20	0.157	0.124	-9.06
30	0.131	0.086	-10.66
40	0.143	0.104	-9.84
50	0.216	0.235	-6.29
60	0.333	0.560	-2.52
70	0.470	1.113	0.46
80	0.592	1.769	2.48
90	0.688	2.388	3.78
100	0.763	2.937	4.68
110	0.828	3.453	5.38
120	0.892	4.014	6.04
130	0.949	4.537	6.57
140	0.985	4.891	6.89
150	1.000	5.040	7.02
160	0.993	4.969	6.96
170	0.976	4.801	6.81
180	0.960	4.645	6.67
190	0.943	4.482	6.51
200	0.920	4.266	6.30
210	0.908	4.155	6.19
220	0.897	4.055	6.08
230	0.898	4.064	6.09
240	0.900	4.082	6.11
250	0.915	4.220	6.25
260	0.933	4.392	6.43
270	0.979	4.831	6.84
280	0.996	5.004	6.99
290	0.984	4.878	6.88
300	0.934	4.393	6.43
310	0.850	3.638	5.61
320	0.733	2.705	4.32
330	0.594	1.779	2.50
340	0.451	1.026	0.11
350	0.325	0.531	-2.75

Maximum Value

Field 1.00
Gain 5.04 (7.02 dB)
Azimuth Bearing 150 degrees

Minimum Field

Field 0.130
Gain .085 (-10.70 dB)
Azimuth Bearing 35 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.242	0.295	-5.30
10	0.209	0.220	-6.57
20	0.214	0.231	-6.37
30	0.221	0.246	-6.09
40	0.221	0.246	-6.09
50	0.217	0.237	-6.25
60	0.206	0.215	-6.68
70	0.229	0.264	-5.78
80	0.331	0.551	-2.59
90	0.467	1.097	0.40
100	0.608	1.860	2.70
110	0.727	2.664	4.26
120	0.823	3.412	5.33
130	0.888	3.970	5.99
140	0.934	4.396	6.43
150	0.967	4.718	6.74
160	0.993	4.971	6.96
170	0.999	5.032	7.02
180	0.997	5.015	7.00
190	0.991	4.950	6.95
200	0.978	4.822	6.83
210	0.971	4.754	6.77
220	0.965	4.697	6.72
230	0.967	4.714	6.73
240	0.966	4.704	6.72
250	0.959	4.638	6.66
260	0.946	4.506	6.54
270	0.922	4.287	6.32
280	0.876	3.872	5.88
290	0.826	3.437	5.36
300	0.772	3.004	4.78
310	0.707	2.520	4.01
320	0.616	1.914	2.82
330	0.516	1.340	1.27
340	0.412	0.856	-0.68
350	0.310	0.484	-3.15

Maximum Value

Field 1.00
Gain 5.04 (7.02 dB)
Azimuth Bearing 175 degrees

Minimum Field

Field 0.203
Gain .208 (-6.83 dB)
Azimuth Bearing 5 degrees

ERP Tabulation

Antenna Model: PSIFMR-6C-R-DA

Marfa Public Radio

Station: KXWT

Frequency: 91.3 MHz

Location: Odessa, TX

Maximum ERP: 40.0 kW

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.246	2.43	3.85
10	0.195	1.52	1.83
20	0.157	0.99	-0.07
30	0.131	0.68	-1.66
40	0.143	0.82	-0.85
50	0.216	1.87	2.71
60	0.333	4.44	6.47
70	0.470	8.83	9.46
80	0.592	14.04	11.47
90	0.688	18.95	12.78
100	0.763	23.31	13.68
110	0.828	27.41	14.38
120	0.892	31.86	15.03
130	0.949	36.00	15.56
140	0.985	38.82	15.89
150	1.000	40.00	16.02
160	0.993	39.43	15.96
170	0.976	38.10	15.81
180	0.960	36.87	15.67
190	0.943	35.57	15.51
200	0.920	33.86	15.30
210	0.908	32.98	15.18
220	0.897	32.18	15.08
230	0.898	32.26	15.09
240	0.900	32.40	15.11
250	0.915	33.49	15.25
260	0.933	34.85	15.42
270	0.979	38.34	15.84
280	0.996	39.72	15.99
290	0.984	38.71	15.88
300	0.934	34.86	15.42
310	0.850	28.87	14.60
320	0.733	21.47	13.32
330	0.594	14.12	11.50
340	0.451	8.15	9.11
350	0.325	4.21	6.25

Maximum Value (H-pol)

Field 1.00
ERP 40.0 kW (16.02 dBk)

Azimuth Bearing 150 degrees

Minimum Field (H-pol)

Field 0.130
ERP .676 kW (-1.70 dBk)

Azimuth Bearing 35 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.242	2.34	3.70
10	0.209	1.75	2.42
20	0.214	1.83	2.63
30	0.221	1.95	2.91
40	0.221	1.95	2.91
50	0.217	1.88	2.75
60	0.206	1.71	2.32
70	0.229	2.10	3.21
80	0.331	4.37	6.41
90	0.467	8.71	9.40
100	0.608	14.76	11.69
110	0.727	21.14	13.25
120	0.823	27.08	14.33
130	0.888	31.51	14.98
140	0.934	34.89	15.43
150	0.967	37.44	15.73
160	0.993	39.45	15.96
170	0.999	39.94	16.01
180	0.997	39.80	16.00
190	0.991	39.29	15.94
200	0.978	38.27	15.83
210	0.971	37.73	15.77
220	0.965	37.28	15.71
230	0.967	37.42	15.73
240	0.966	37.33	15.72
250	0.959	36.81	15.66
260	0.946	35.77	15.53
270	0.922	34.02	15.32
280	0.876	30.73	14.88
290	0.826	27.28	14.36
300	0.772	23.84	13.77
310	0.707	20.00	13.01
320	0.616	15.19	11.81
330	0.516	10.64	10.27
340	0.412	6.79	8.32
350	0.310	3.84	5.85

Maximum Value (V-pol)

Field 1.00
ERP 40.0 kW (16.02 dBk)

Azimuth Bearing 175 degrees

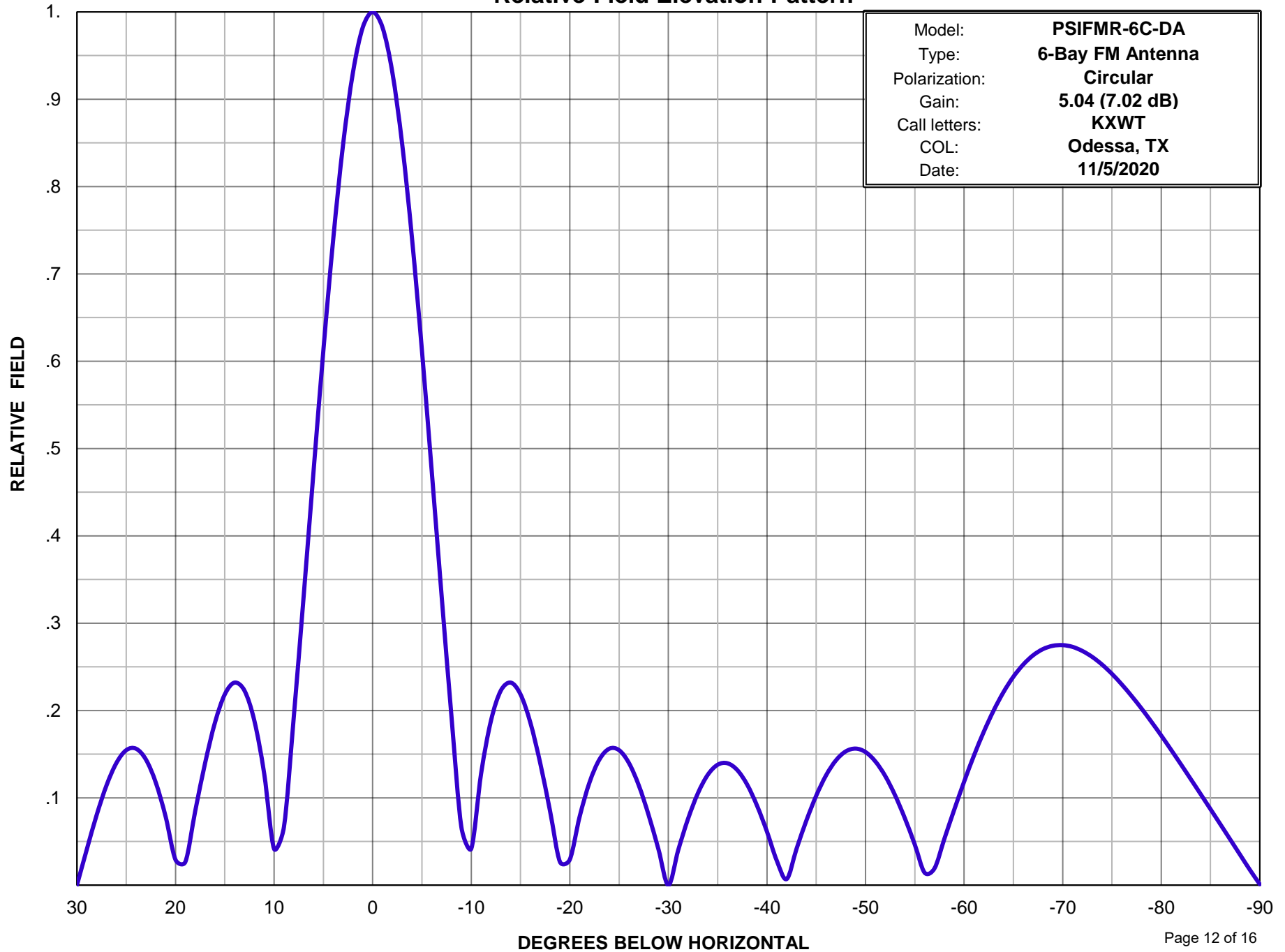
Minimum Field (V-pol)

Field 0.203
ERP 1.65 kW (2.17 dBk)

Azimuth Bearing 5 degrees



Relative Field Elevation Pattern



Propagation Systems Inc.

Relative Field Tabulation Elevation Pattern

Antenna Model: PSIFMR-6C-DA

Gain: 5.04 (7.02 dBd)

Station: KXWT

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90	0.001	-60.00	-50	0.152	-16.34	-10	0.042	-27.60
-89	0.017	-35.18	-49	0.156	-16.12	-9	0.067	-23.54
-88	0.035	-29.16	-48	0.153	-16.30	-8	0.193	-14.30
-87	0.052	-25.63	-47	0.143	-16.90	-7	0.331	-9.61
-86	0.070	-23.14	-46	0.126	-18.01	-6	0.473	-6.50
-85	0.087	-21.21	-45	0.102	-19.79	-5	0.612	-4.26
-84	0.104	-19.64	-44	0.074	-22.62	-4	0.740	-2.62
-83	0.121	-18.32	-43	0.042	-27.64	-3	0.848	-1.43
-82	0.138	-17.18	-42	0.007	-43.14	-2	0.931	-0.62
-81	0.155	-16.19	-41	0.028	-31.05	-1	0.982	-0.16
-80	0.171	-15.32	-40	0.061	-24.24	0	1.000	0.00
-79	0.187	-14.56	-39	0.091	-20.83	1	0.982	-0.15
-78	0.202	-13.88	-38	0.115	-18.79	2	0.931	-0.62
-77	0.217	-13.29	-37	0.132	-17.61	3	0.848	-1.43
-76	0.230	-12.77	-36	0.140	-17.11	4	0.740	-2.62
-75	0.242	-12.32	-35	0.138	-17.21	5	0.612	-4.26
-74	0.253	-11.95	-34	0.126	-17.97	6	0.473	-6.50
-73	0.261	-11.66	-33	0.105	-19.55	7	0.331	-9.61
-72	0.268	-11.43	-32	0.076	-22.38	8	0.193	-14.29
-71	0.273	-11.28	-31	0.040	-27.93	9	0.067	-23.52
-70	0.275	-11.22	-30	0.001	-60.00	10	0.042	-27.64
-69	0.274	-11.24	-29	0.041	-27.76	11	0.127	-17.89
-68	0.270	-11.36	-28	0.080	-21.92	12	0.188	-14.51
-67	0.263	-11.59	-27	0.114	-18.84	13	0.223	-13.04
-66	0.253	-11.95	-26	0.140	-17.09	14	0.232	-12.69
-65	0.239	-12.45	-25	0.155	-16.22	15	0.218	-13.21
-64	0.221	-13.11	-24	0.156	-16.13	16	0.186	-14.61
-63	0.200	-13.98	-23	0.144	-16.85	17	0.140	-17.10
-62	0.176	-15.11	-22	0.118	-18.59	18	0.085	-21.43
-61	0.148	-16.58	-21	0.078	-22.10	19	0.027	-31.48
-60	0.118	-18.54	-20	0.029	-30.68	20	0.029	-30.72
-59	0.086	-21.27	-19	0.027	-31.48	21	0.078	-22.12
-58	0.053	-25.51	-18	0.085	-21.44	22	0.117	-18.60
-57	0.019	-34.31	-17	0.140	-17.10	23	0.144	-16.85
-56	0.014	-36.93	-16	0.186	-14.61	24	0.156	-16.13
-55	0.047	-26.65	-15	0.218	-13.21	25	0.155	-16.22
-54	0.076	-22.34	-14	0.232	-12.69	26	0.140	-17.09
-53	0.103	-19.75	-13	0.223	-13.04	27	0.114	-18.84
-52	0.125	-18.06	-12	0.188	-14.51	28	0.080	-21.91
-51	0.142	-16.97	-11	0.128	-17.88	29	0.041	-27.76

EXHIBIT B- Surveyor Letter



S. W. HOWELL, INC.

P. O. Box 22
Odessa, Texas, 79760
432-367-5711

swh@swhowell.com

Texas Engineering Firm #F-173
Texas Surveying Firm #F-100147-00

June 30, 2021

Re: Certification of Antenna Installation.

To: Federal Communications Commission
And Marfa Public Radio

To Whom It May Concern,

I hereby certify that on June 2nd, 2021, a field survey was performed at the Insite LLC Air Terminal Tower ASR# 1053974, located at (32° 02' 54.6"N, 102° 18' 05.6"W) 16841 Derby Avenue, Gardendale, Ector County, Texas, to establish a line-of-sight target for the installation of the KXWT Directional Antenna and that the bays were aligned on an azimuth of 210.0000 degrees True North from center of the said tower.

H. Gene Smith
Registered Professional Land Surveyor
Number 4931 – Texas



Job# 21-36480
Client:
Marfa Public Radio
111 S. Highland Avenue
(P.O. Box 238)
Marfa, TX 79843

EXHIBIT C- Letter from Jim Stanford

Jim Stanford

6/15/2021

PO Box 24032

Waco, Texas 76702

Engineering Statement of Certification

The antenna system for KXWT-Odessa Texas under construction permit BLED-20120406AAH was installed by an experienced tower crew under my direct supervision in June 2-5 2021. The directions from the manufacturer, PSI, were followed closely. A surveyor was present to assist and certify the height and bearing of this antenna. His statement is found as part of the document. I have over 40 years of experience in broadcast engineering and my work is a matter of record at the FCC. To the best of my knowledge, this antenna meets the terms of the construction permit.

Thank you

Jim Stanford

936 402 5583

EXHIBIT D- Community of License Coverage

KXWT (217C2) Community of License Coverage, Odessa, Texas

