



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

**Directional FM Antenna
KTRG
Family Life Broadcasting, Inc.
Hooks, TX**

A standard model PSIFM antenna with parasitic elements and custom support mast was modified and used in conjunction with a model of the customer's triangular tower to create the necessary directional radiation pattern. The final antenna consists of three radiating elements each secured to a custom support mast mounted to the southwest tower face. The antenna bays are full wavelength spaced and there is one horizontal parasitic element per bay. The antenna array is end fed. Each radiating element receives equal power and phase.

Pattern testing was performed using a 1/3-scale model element, tower and mast. 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 282.3 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 94.4% of the envelope RMS.

The antenna is to be mounted 155 meters (508.4 ft.) above ground level per the construction permit. A deviation of +2/-4 meters from the approved center of radiation is allowed. No other antenna can be installed within 10 ft of any radiating element. The antenna is to be mounted to the southwest tower face and positioned 225° True and certified by a licensed surveyor. 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 1.0 kW will be required at the antenna input in order to reach the licensed 2.35 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

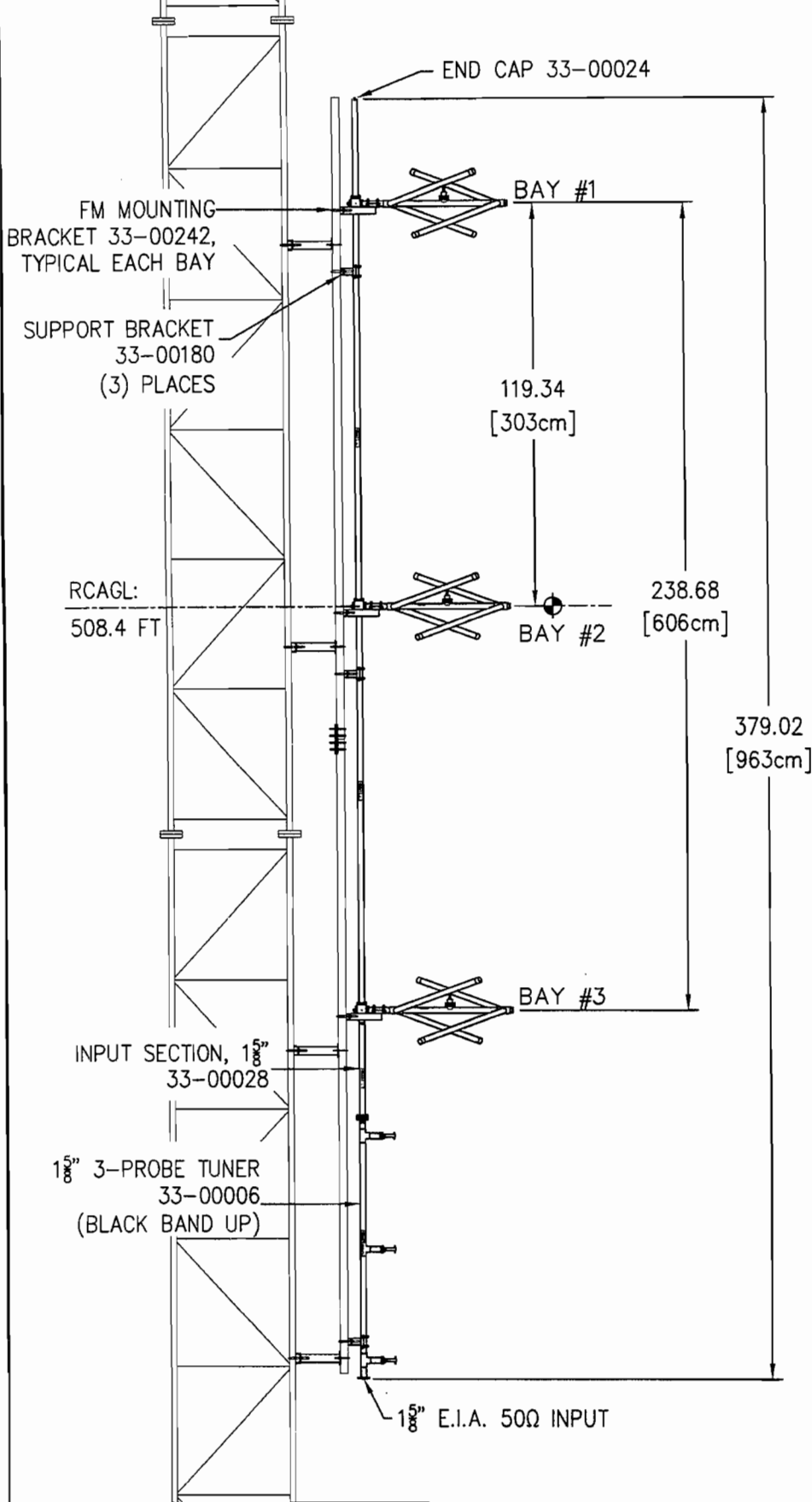
Antenna Model	PSIFM-3-DA
Type	3-bay directional FM antenna
Bay Spacing	Full wavelength spaced elements
Frequency	94.1 MHz
Polarization	Circular
Envelope RMS	.865
Composite RMS	.817
Gain (h-pol)	2.34 (3.69 dB)
Gain (v-pol)	2.34 (3.69 dB)
Input	1-5/8" EIA end fed input
Input power	1.0 kW
Power rating	9 kW
Length	31.59 ft.
Weight	190.7 lbs.
Wind Area	14.6 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.



ANTENNA SPECIFICATIONS	
SPACING:	1.0λ
LENGTH:	31.59 FT [9.63m]
APERTURE:	19.89 FT [6.06m]
RATING:	9 kW
GAIN:	2.34 (3.69 dB)
WEIGHT:	190.7 LB [86.67 Kg]
WINDAREA:	14.6 Ft ²
TIA-222-F	(NO ICE)
NOTE:	
1. REF. J812FM-1107-000 FOR ASSEMBLY DETAILS AT BAYS 1 AND 2	
2. REF. J812FM-1107-000 FOR ASSEMBLY DETAILS AT INPUT	
3. 3-PROBE TUNER 33-00019 SHOWN ROTATED FOR DRAWING CLARITY	

MAST SPECIFICATIONS	
LENGTH:	31.5 FT [9.60m]
WEIGHT:	217 LB [98.4 Kg]
WINDAREA:	10.7 Ft ²
TIA-222-F	(NO ICE)

REV.	MADE BY CHECKED BY	DATE	CHANGE

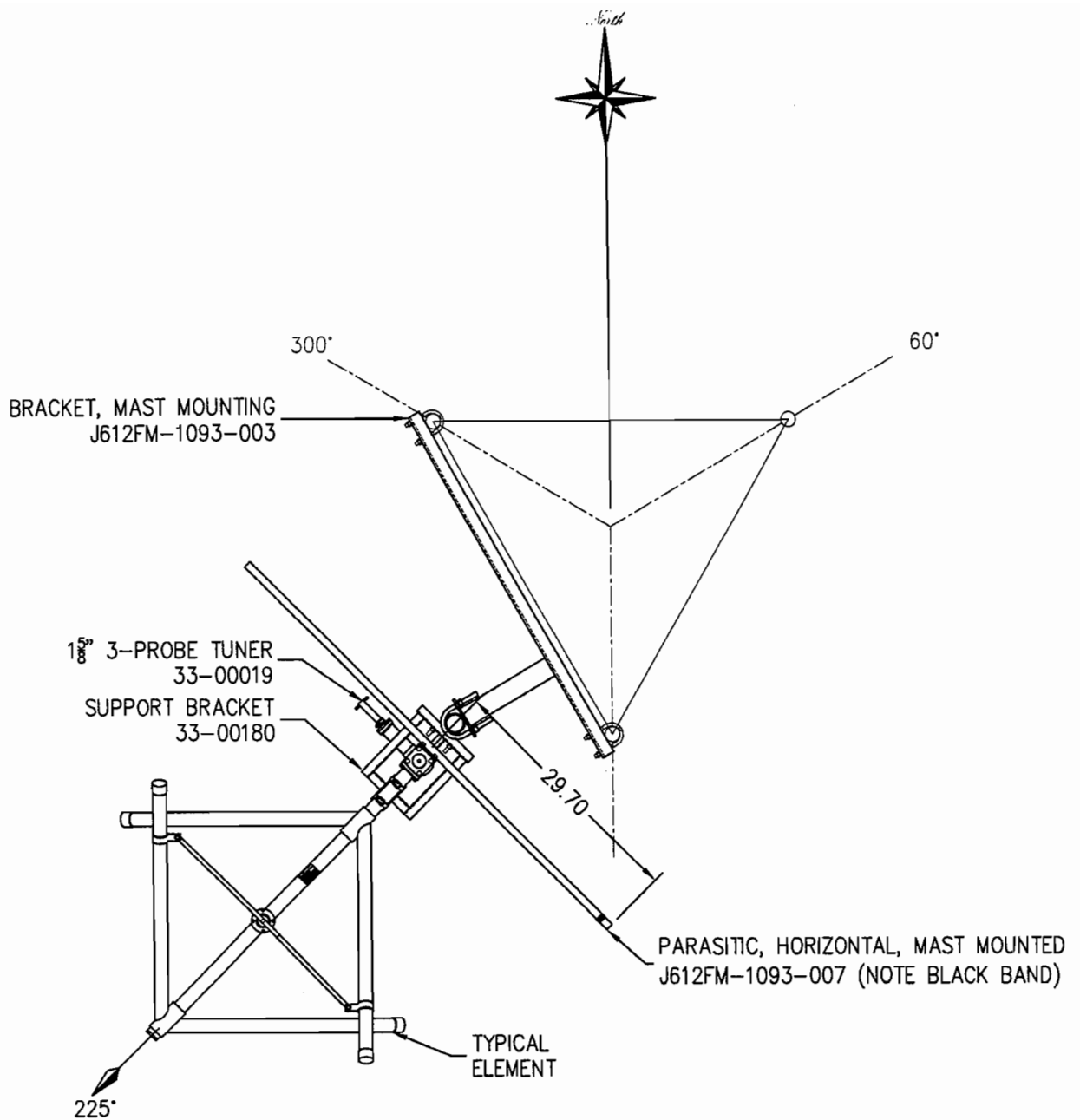
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SIZE
A

PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATIONS AND SPECIFICATIONS			
MODEL:	PSIFM-3-DA	DRAWN BY:	D.G. Kellar
CHANNEL/ FREQUENCY:	94.1 MHz	APPROVED BY:	
SCALE:	1:50	DRAWING NO.:	J612FM-1093-001
		DATE:	8/23/12
		REV.	



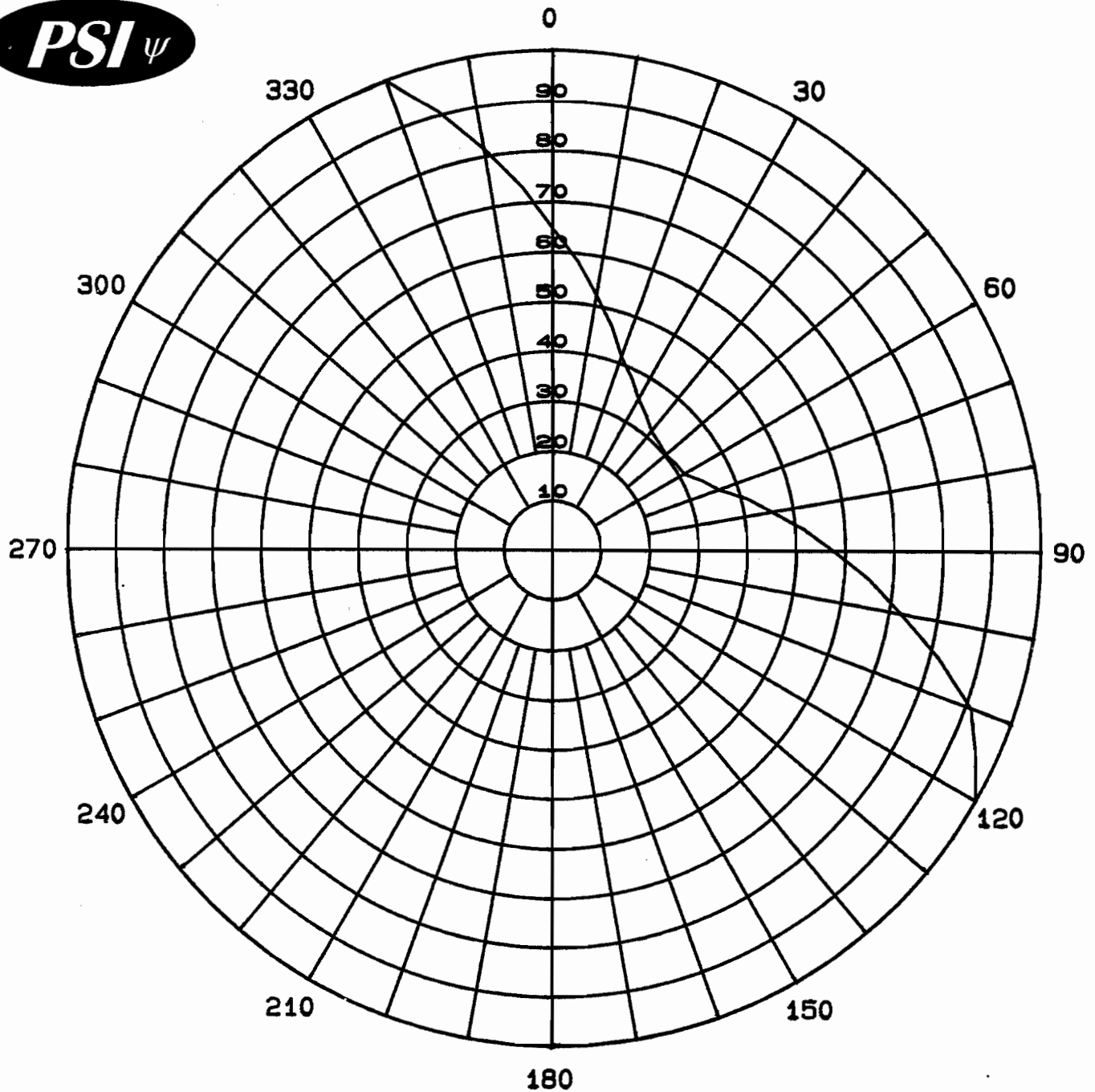
REV.	MADE BY CHECKED BY	DATE	CHANGE
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			SIZE A

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ANTENNA PLAN VIEW AND ORIENTATION

MODEL:	PSIFM-3-DA	DRAWN BY:	D.A. Kellar	DATE:	8/23/12
CHANNEL/ FREQUENCY:	94.1 MHz	APPROVED BY:		DATE:	
SCALE:	1:20	DRAWING NO.:	J612FM-1093-002	REV.	



Maximum Envelope
Azimuth Plane Pattern
Antenna: PSIFM-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 2.35 kW (3.71 dBk)
RMS Envelope: .865
Frequency: 94.1 MHz
KTRG Hooks, TX

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Maximum Envelope Tabulation

Antenna: PSIFM-3-DA

Family Life Broadcasting, Inc.

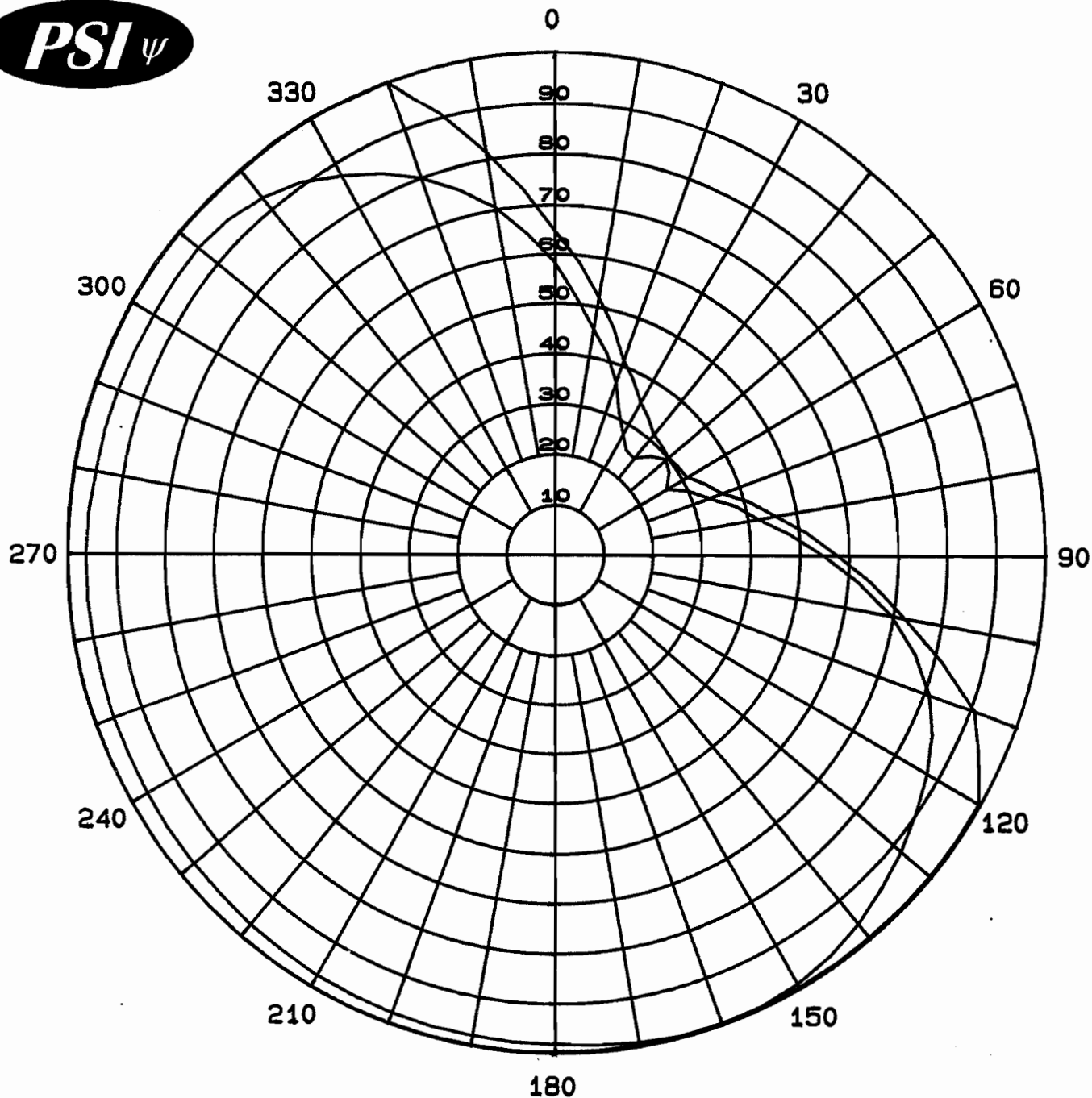
Station: KTRG

Frequency: 94.1 MHz

Location: Hooks, TX

Maximum ERP: 2.35 kW (3.71 dBk)

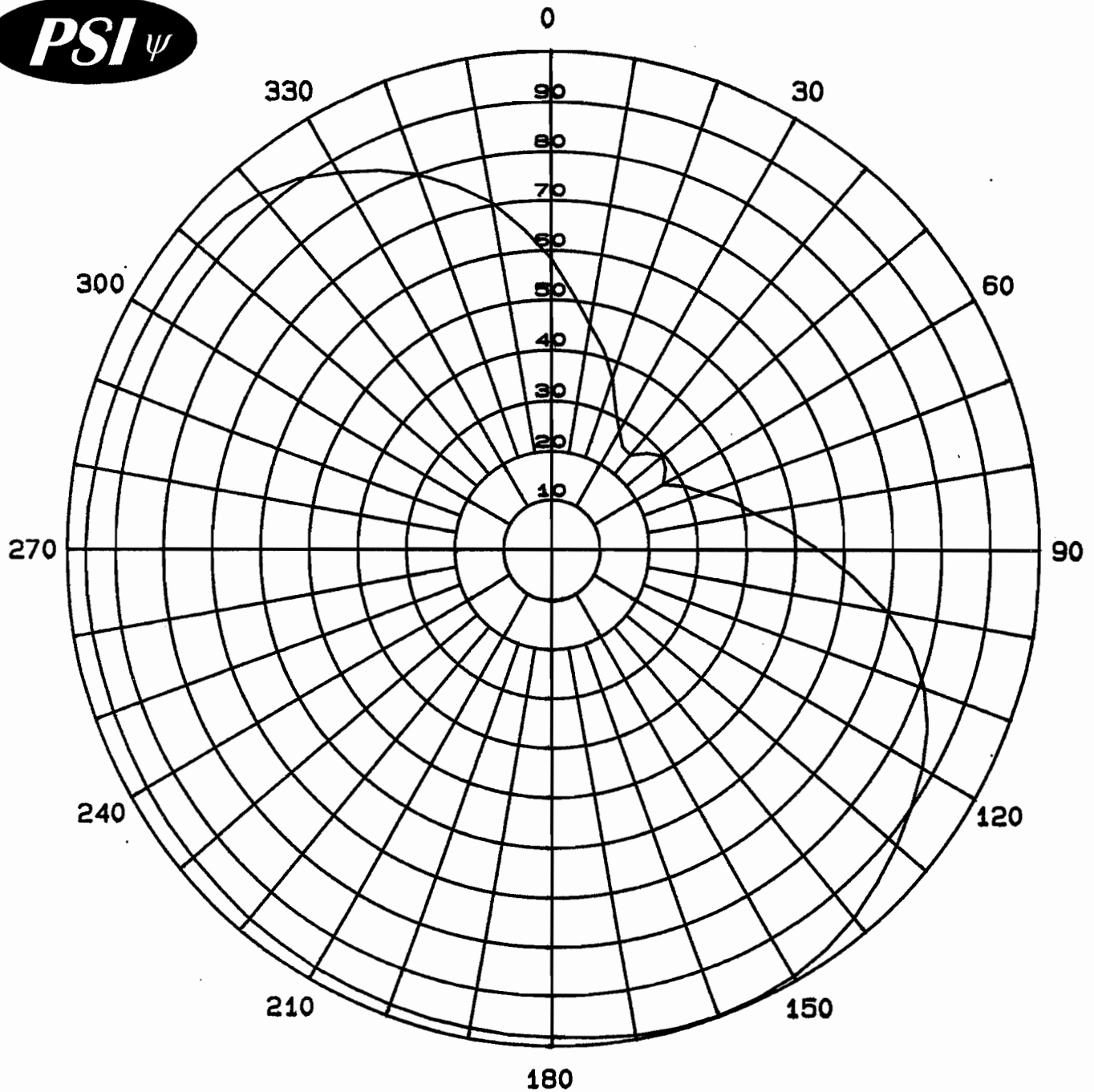
Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.648	0.99	-0.06
10	0.519	0.63	-1.99
20	0.412	0.40	-3.99
30	0.351	0.29	-5.38
40	0.314	0.23	-6.35
50	0.302	0.21	-6.69
60	0.311	0.23	-6.43
70	0.362	0.31	-5.12
80	0.456	0.49	-3.11
90	0.574	0.77	-1.11
100	0.723	1.23	0.89
110	0.910	1.95	2.89
120	1.000	2.35	3.71
130	1.000	2.35	3.71
140	1.000	2.35	3.71
150	1.000	2.35	3.71
160	1.000	2.35	3.71
170	1.000	2.35	3.71
180	1.000	2.35	3.71
190	1.000	2.35	3.71
200	1.000	2.35	3.71
210	1.000	2.35	3.71
220	1.000	2.35	3.71
230	1.000	2.35	3.71
240	1.000	2.35	3.71
250	1.000	2.35	3.71
260	1.000	2.35	3.71
270	1.000	2.35	3.71
280	1.000	2.35	3.71
290	1.000	2.35	3.71
300	1.000	2.35	3.71
310	1.000	2.35	3.71
320	1.000	2.35	3.71
330	1.000	2.35	3.71
340	1.000	2.35	3.71
350	0.815	1.56	1.93



Maximum Envelope and
Composite Pattern
Antenna: PSIFM-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 2.35 kW (3.71 dBk)
RMS Envelope: .865
RMS Composite: .817
Frequency: 94.1 MHz

Propagation Systems Inc.
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Ebensburg, PA 15931

KTRG Hooks, TX



Measured Composite
Azimuth Plane Pattern
Antenna: PSIFM-3-DA
Type: 3-Bay Directional FM Antenna
ERP: 2.35 kW (3.71 dBk)
RMS Composite: .817
Frequency: 94.1 MHz
KTRG Hooks, TX

Propagation Systems Inc.
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Ebensburg, PA 15931

Composite Pattern Tabulation

Antenna: PSIFM-3-DA

Family Life Broadcasting, Inc.

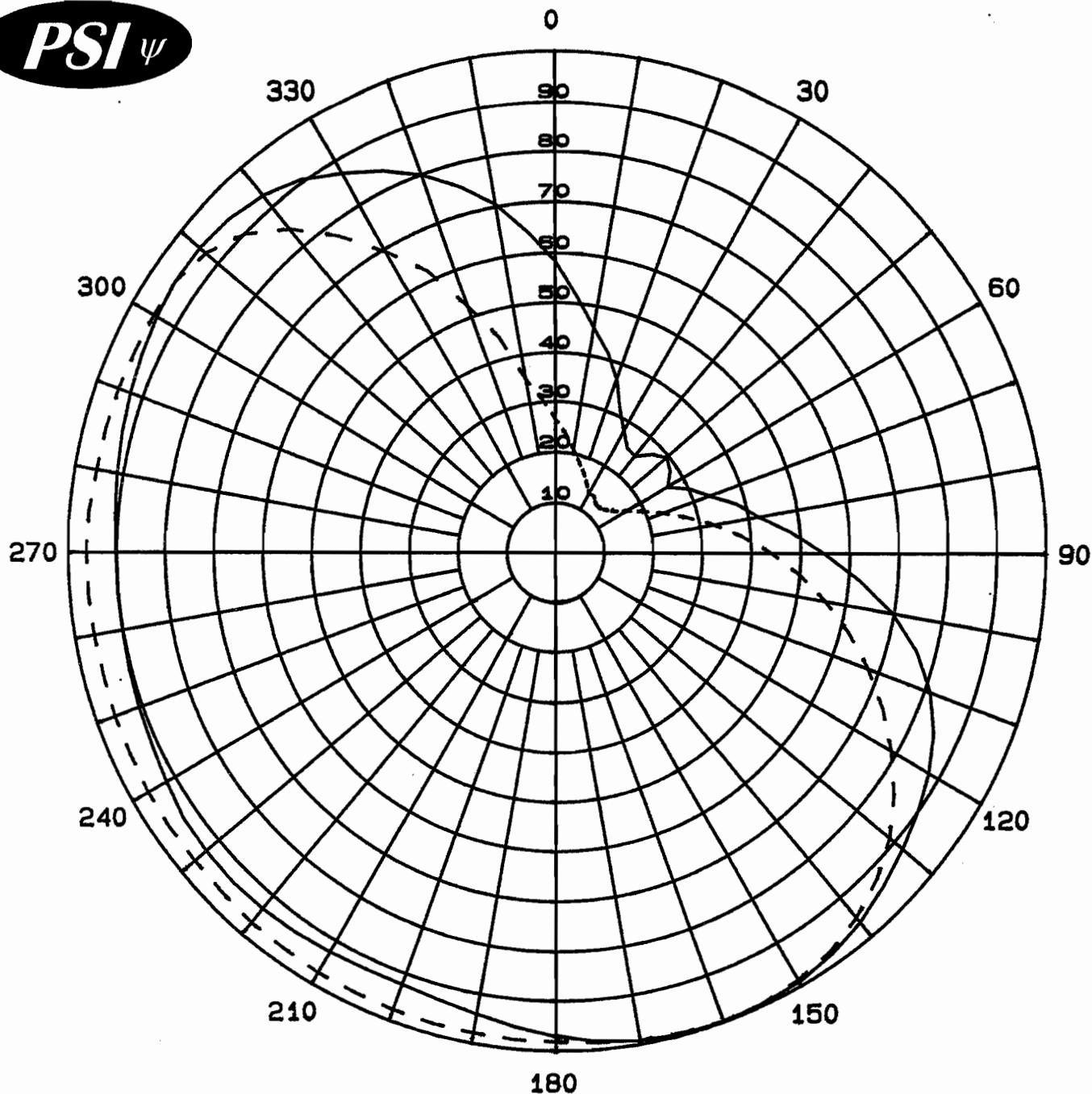
Station: KTRG

Frequency: 94.1 MHz

Location: Hooks, TX

Maximum ERP: 2.35 kW (3.71 dBk)

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.583	0.80	-0.98
10	0.455	0.49	-3.13
20	0.365	0.31	-5.04
30	0.278	0.18	-7.41
40	0.251	0.15	-8.30
50	0.295	0.20	-6.89
60	0.263	0.16	-7.89
70	0.334	0.26	-5.81
80	0.420	0.41	-3.82
90	0.545	0.70	-1.56
100	0.696	1.14	0.56
110	0.811	1.55	1.89
120	0.877	1.81	2.57
130	0.922	2.00	3.01
140	0.964	2.18	3.39
150	0.992	2.31	3.64
160	1.000	2.35	3.71
170	0.994	2.32	3.66
180	0.983	2.27	3.56
190	0.980	2.26	3.54
200	0.978	2.25	3.52
210	0.975	2.23	3.49
220	0.970	2.21	3.45
230	0.965	2.19	3.40
240	0.963	2.18	3.38
250	0.961	2.17	3.37
260	0.961	2.17	3.37
270	0.962	2.17	3.37
280	0.955	2.14	3.31
290	0.952	2.13	3.28
300	0.948	2.11	3.25
310	0.949	2.12	3.26
320	0.929	2.03	3.07
330	0.872	1.79	2.52
340	0.800	1.50	1.77
350	0.705	1.17	0.67



Measured Relative Field
Azimuth Plane Pattern
Antenna: PSIFM-3-DA
Type: 3-Bay Directional FM Antenna
Gain H-pol (solid): 2.35 (3.71 dB)
Gain V-pol (dash): 2.35 (3.71 dB)
Frequency: 94.1 MHz
KTRG Hooks, TX

Propagation Systems Inc.
PO Box 113
Ebensburg, PA 15931

Measured Relative Field Tabulation

Antenna: PSIFM-3-DA
Family Life Broadcasting, Inc.
Station: KTRG
Frequency: 94.1 MHz
Location: Hooks, TX

Horizontal Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.583	0.80	-0.99
10	0.455	0.48	-3.15
20	0.365	0.31	-5.06
30	0.278	0.18	-7.43
40	0.251	0.15	-8.31
50	0.295	0.20	-6.91
60	0.263	0.16	-7.91
70	0.334	0.26	-5.83
80	0.420	0.41	-3.84
90	0.545	0.70	-1.58
100	0.696	1.13	0.54
110	0.811	1.54	1.87
120	0.877	1.80	2.55
130	0.922	1.99	2.99
140	0.964	2.17	3.37
150	0.992	2.30	3.62
160	1.000	2.34	3.69
170	0.994	2.31	3.64
180	0.971	2.21	3.44
190	0.941	2.07	3.16
200	0.923	1.99	3.00
210	0.926	2.01	3.02
220	0.934	2.04	3.10
230	0.934	2.04	3.10
240	0.920	1.98	2.97
250	0.908	1.93	2.85
260	0.902	1.90	2.80
270	0.902	1.90	2.80
280	0.913	1.95	2.90
290	0.927	2.01	3.03
300	0.942	2.08	3.17
310	0.949	2.11	3.24
320	0.929	2.02	3.05
330	0.872	1.78	2.50
340	0.800	1.50	1.75
350	0.705	1.16	0.66

Maximum Value

Field 1.00
Gain 2.34 (3.69 dB)
Azimuth Bearing 160 degrees

Minimum Field

Field 0.251
Gain .147 (-8.31 dB)
Azimuth Bearing 40 degrees

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.265	0.16	-7.84
10	0.208	0.10	-9.95
20	0.168	0.07	-11.80
30	0.136	0.04	-13.64
40	0.127	0.04	-14.23
50	0.133	0.04	-13.83
60	0.167	0.07	-11.85
70	0.232	0.13	-9.00
80	0.326	0.25	-6.04
90	0.438	0.45	-3.48
100	0.557	0.73	-1.39
110	0.676	1.07	0.29
120	0.789	1.46	1.63
130	0.888	1.85	2.66
140	0.953	2.13	3.27
150	0.988	2.28	3.59
160	1.000	2.34	3.69
170	0.994	2.31	3.64
180	0.983	2.26	3.54
190	0.980	2.25	3.52
200	0.978	2.24	3.50
210	0.975	2.22	3.47
220	0.970	2.20	3.43
230	0.965	2.18	3.38
240	0.963	2.17	3.36
250	0.961	2.16	3.35
260	0.961	2.16	3.35
270	0.962	2.17	3.36
280	0.955	2.13	3.29
290	0.952	2.12	3.26
300	0.948	2.10	3.23
310	0.931	2.03	3.07
320	0.843	1.66	2.21
330	0.694	1.13	0.52
340	0.522	0.64	-1.95
350	0.349	0.29	-5.45

Maximum Value

Field 1.00
Gain 2.34 (3.69 dB)
Azimuth Bearing 160 degrees

Minimum Field

Field 0.126
Gain .037 (-14.30 dB)
Azimuth Bearing 45 degrees

ERP Tabulation

Antenna: PSIFM-3-DA

Family Life Broadcasting, Inc.

Station: KTRG

Frequency: 94.1 MHz

Location: Hooks, TX

Maximum ERP: 2.35 kW (3.71 dBk)

Horizontal Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.583	0.80	-0.98
10	0.455	0.49	-3.13
20	0.365	0.31	-5.04
30	0.278	0.18	-7.41
40	0.251	0.15	-8.30
50	0.295	0.20	-6.89
60	0.263	0.16	-7.89
70	0.334	0.26	-5.81
80	0.420	0.41	-3.82
90	0.545	0.70	-1.56
100	0.696	1.14	0.56
110	0.811	1.55	1.89
120	0.877	1.81	2.57
130	0.922	2.00	3.01
140	0.964	2.18	3.39
150	0.992	2.31	3.64
160	1.000	2.35	3.71
170	0.994	2.32	3.66
180	0.971	2.22	3.46
190	0.941	2.08	3.18
200	0.923	2.00	3.01
210	0.926	2.02	3.04
220	0.934	2.05	3.12
230	0.934	2.05	3.12
240	0.920	1.99	2.99
250	0.908	1.94	2.87
260	0.902	1.91	2.81
270	0.902	1.91	2.81
280	0.913	1.96	2.92
290	0.927	2.02	3.05
300	0.942	2.09	3.19
310	0.949	2.12	3.26
320	0.929	2.03	3.07
330	0.872	1.79	2.52
340	0.800	1.50	1.77
350	0.705	1.17	0.67

Maximum Value (H-pol)

Field 1.00
ERP 2.35 kW (3.71 dBk)

Azimuth Bearing 160 degrees

Minimum Field (H-pol)

Field 0.251
ERP .148 kW (-8.30 dBk)

Azimuth Bearing 40 degrees

Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.265	0.17	-7.82
10	0.208	0.10	-9.93
20	0.168	0.07	-11.78
30	0.136	0.04	-13.62
40	0.127	0.04	-14.21
50	0.133	0.04	-13.81
60	0.167	0.07	-11.83
70	0.232	0.13	-8.98
80	0.326	0.25	-6.02
90	0.438	0.45	-3.46
100	0.557	0.73	-1.37
110	0.676	1.07	0.31
120	0.789	1.46	1.65
130	0.888	1.85	2.68
140	0.953	2.13	3.29
150	0.988	2.29	3.61
160	1.000	2.35	3.71
170	0.994	2.32	3.66
180	0.983	2.27	3.56
190	0.980	2.26	3.54
200	0.978	2.25	3.52
210	0.975	2.23	3.49
220	0.970	2.21	3.45
230	0.965	2.19	3.40
240	0.963	2.18	3.38
250	0.961	2.17	3.37
260	0.961	2.17	3.37
270	0.962	2.17	3.37
280	0.955	2.14	3.31
290	0.952	2.13	3.28
300	0.948	2.11	3.25
310	0.931	2.04	3.09
320	0.843	1.67	2.23
330	0.694	1.13	0.54
340	0.522	0.64	-1.94
350	0.349	0.29	-5.43

Maximum Value (V-pol)

Field 1.00
ERP 2.35 kW (3.71 dBk)

Azimuth Bearing 160 degrees

Minimum Field (V-pol)

Field 0.126
ERP .037 kW (-14.28 dBk)

Azimuth Bearing 45 degrees



Relative Field Elevation Pattern
Model: PSIFM-3-DA
Type: Directional FM
Polarization: Circular
Number of Bays: Three
Gain: 2.35 (3.71 dB)
KTRG Hooks, TX

