



Propagation Systems, Inc.

Quality Broadcast Antenna Systems

Directional FM Antenna

KCJH

Your Christian Companion Network, Inc.

Livingston, CA

A standard model PSIFMV antenna with parasitic elements was used in conjunction with the customer's 24-1/4" face triangular tower to create the necessary directional radiation pattern. The final antenna consists of three radiating elements each secured to the tower with a custom mounting bracket. The antenna bays are full-wave spaced and there are a total of two vertical parasitic elements per bay. The antenna array is end fed from an existing flexible transmission line. Each radiating element receives equal power and the correct 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 were 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 267.3 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 93% of the envelope RMS.

The antenna is to be mounted 92 meters (301.8 ft.) +2/-4 meters above ground level on the southeast tower face and positioned 150° True. No other antenna can be installed within 10 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.



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The measured principal minima at 340 degrees is .39 kW, below the approved level of .421 kW. An input power level of 2.24 kW will be required at the antenna input in order to reach the approved 13.0 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.

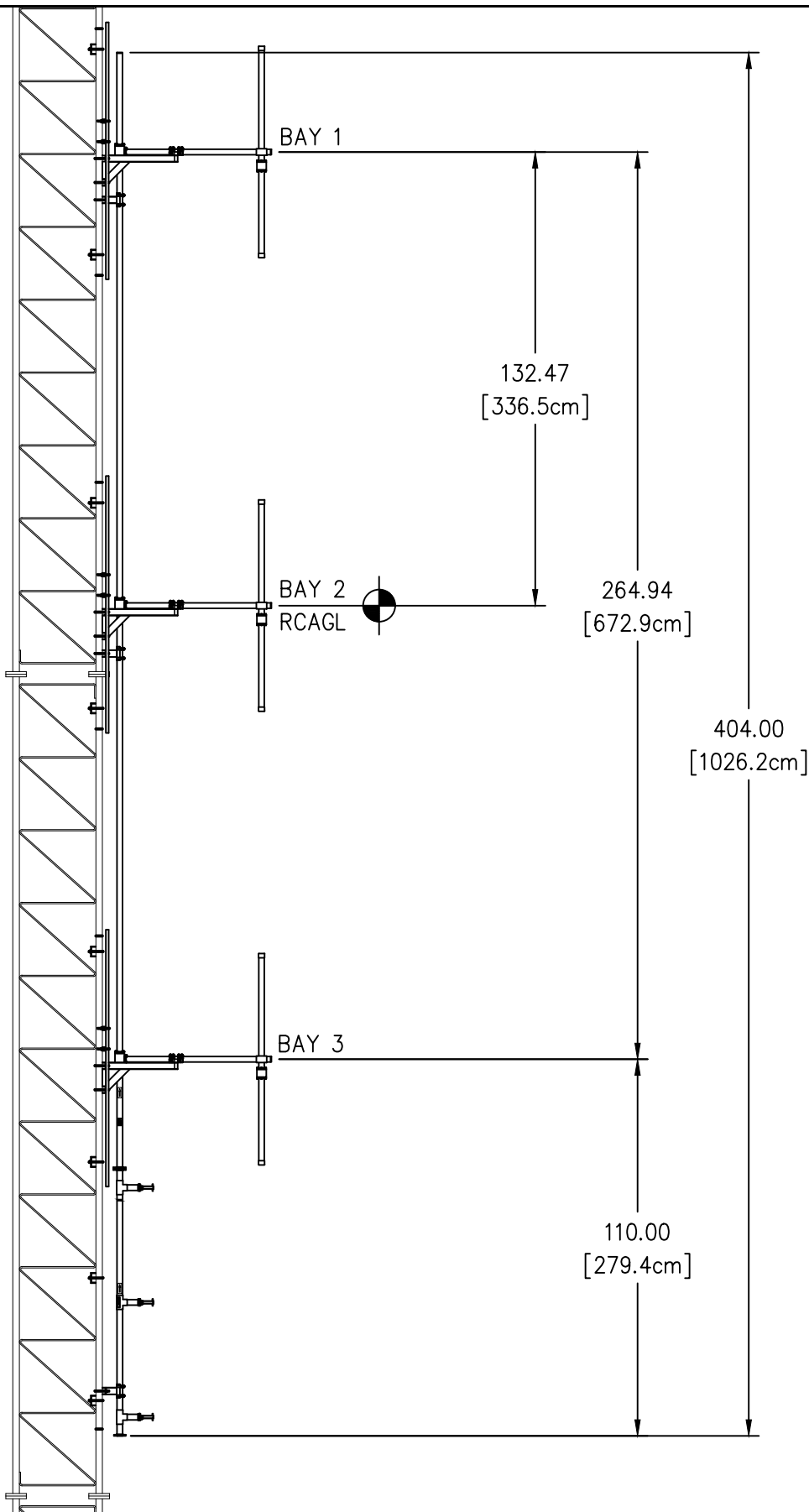
Antenna Specifications

Antenna Model	PSIFMV-3E-DA
Type	3-bay directional FM antenna
Bay Spacing	Full-wave spaced elements
Frequency	89.1 MHz
Polarization	Vertical
Envelope RMS	.756
Composite RMS	.703
Gain	5.80 (7.63 dB)
ERP	13.0 kW
Antenna input power	2.24 kW
Input	1-5/8" EIA end fed input
Power rating	9 kW
Length	33.7 ft.
Weight	290 lbs.
Wind Area	21.4 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'):	132.47 IN (336.5 CM)
APERTURE ('A'):	22.08 FT (6.7 M)
LENGTH ('L'):	33.7 FT (10.3 M)
RCAGL:	301.8 FT (92 M)
WEIGHT:	290 LB (132 Kg)
WIND AREA:	21.4 FT ²
POWER RATING:	9 kW
GAIN:	5.8 (7.63 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
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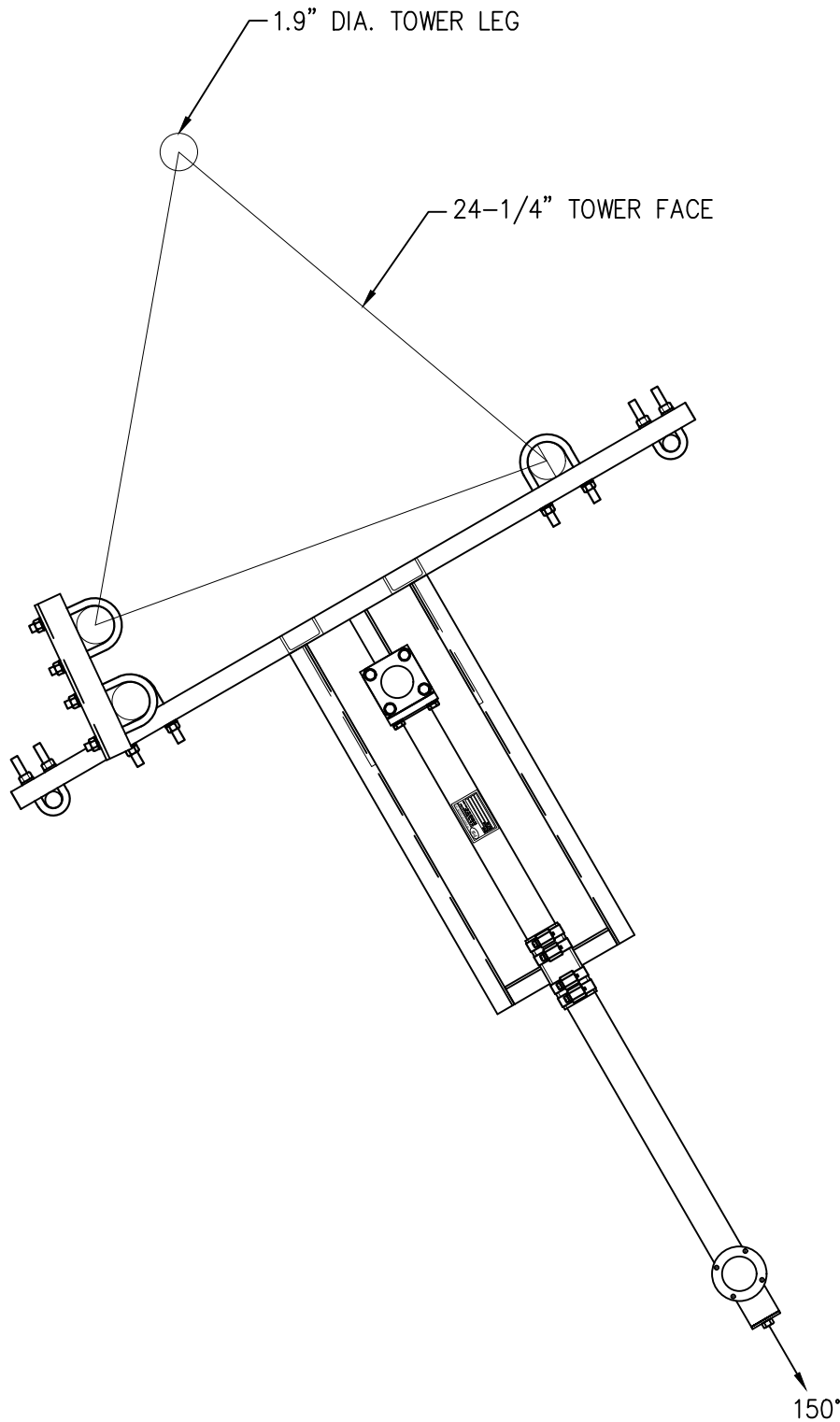
PROPAGATION SYSTEMS, INC.

Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ELEVATION AND SPECIFICATIONS

MODEL:	PSIFMV-3E-DA	DRAWN BY:	M.MOCK	DATE:	03/29/19
CHANNEL/ FREQUENCY:	89.1 MHz	APPROVED BY:		DATE:	
SCALE:		DRAWING NO.:	2012-001	REV.	

North



REV.	MADE BY CHECKED BY	DATE	CHANGE

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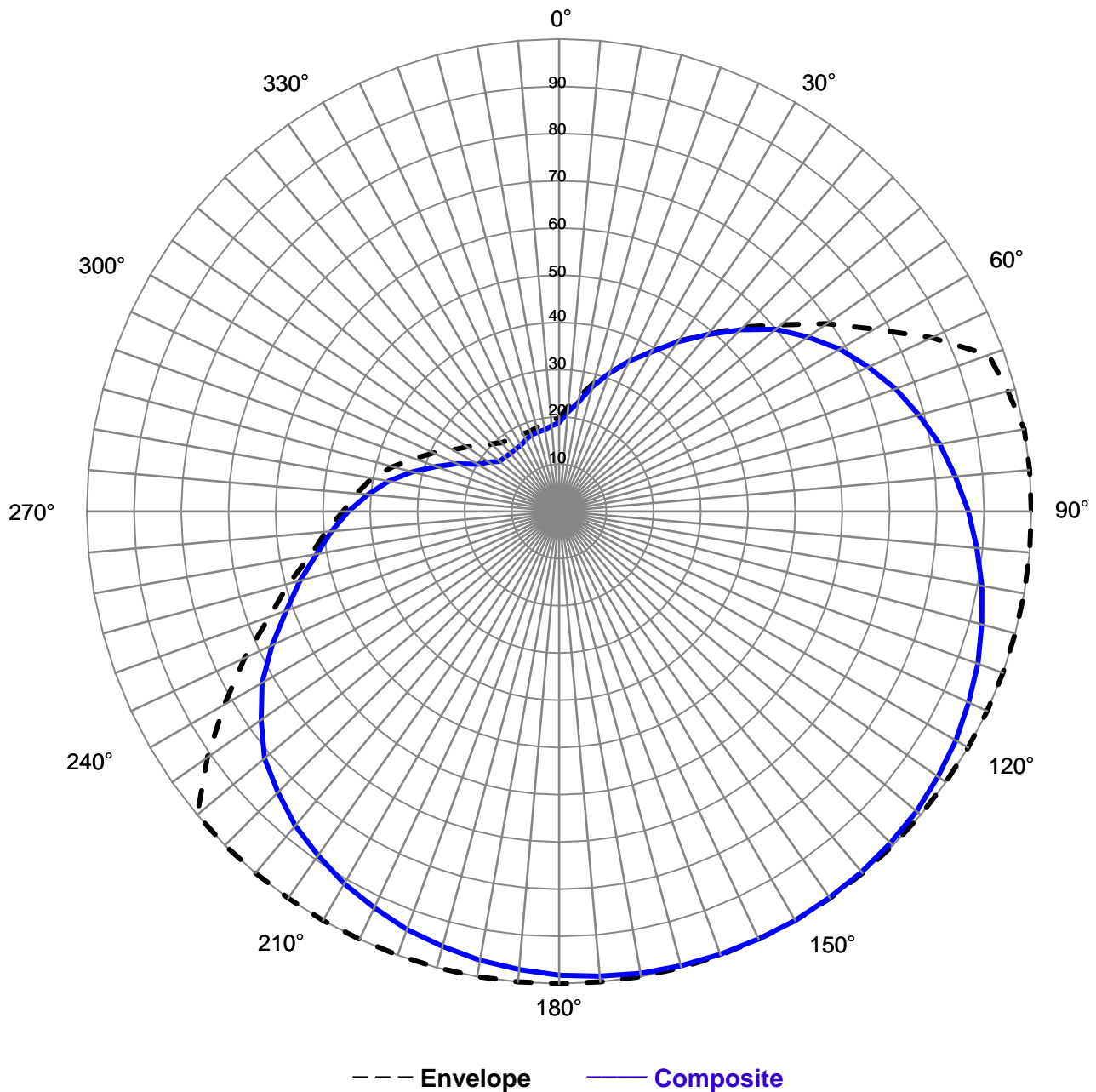
Ebensburg, Pennsylvania USA 814-472-5540

ANTENNA ORIENTATION AND PLAN VIEW

MODEL: PSIFMV-3E-DA	DRAWN BY: M.MOCK	DATE: 03/29/19
CHANNEL/ FREQUENCY: 89.1 MHz	APPROVED BY:	DATE:
SCALE:	DRAWING NO.: 2012-002	REV.



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Composite
Antenna Model:	PSIFMV-3E-DA
Polarization:	Vertical
RMS (envelope)	0.756
RMS (composite)	0.703

Tower:	Rohn 24-1/4"
Orientation:	150°
Frequency:	89.1 MHz
Station:	KCJH
Date:	4/28/2019

Maximum Envelope Tabulation

Antenna Model: PSIFMV-3E-DA

Your Christian Companion Network, Inc.

Station: KCJH

Frequency: 89.1 MHz

Location: Livingston, CA

Maximum ERP: 13 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.198	0.510	-2.93
10	0.248	0.800	-0.97
20	0.311	1.257	0.99
30	0.390	1.977	2.96
40	0.489	3.109	4.93
50	0.614	4.901	6.90
60	0.771	7.728	8.88
70	0.968	12.181	10.86
80	1.000	13.000	11.14
90	1.000	13.000	11.14
100	1.000	13.000	11.14
110	1.000	13.000	11.14
120	1.000	13.000	11.14
130	1.000	13.000	11.14
140	1.000	13.000	11.14
150	1.000	13.000	11.14
160	1.000	13.000	11.14
170	1.000	13.000	11.14
180	1.000	13.000	11.14
190	1.000	13.000	11.14
200	1.000	13.000	11.14
210	1.000	13.000	11.14
220	1.000	13.000	11.14
230	1.000	13.000	11.14
240	0.818	8.699	9.39
250	0.652	5.526	7.42
260	0.534	3.707	5.69
270	0.458	2.727	4.36
280	0.403	2.111	3.25
290	0.326	1.382	1.40
300	0.260	0.879	-0.56
310	0.215	0.601	-2.21
320	0.189	0.464	-3.33
330	0.182	0.431	-3.66
340	0.180	0.421	-3.76
350	0.187	0.455	-3.42

Composite Pattern Tabulation

Antenna Model: PSIFMV-3E-DA

Your Christian Companion Network, Inc.

Station: KCJH

Frequency: 89.1 MHz

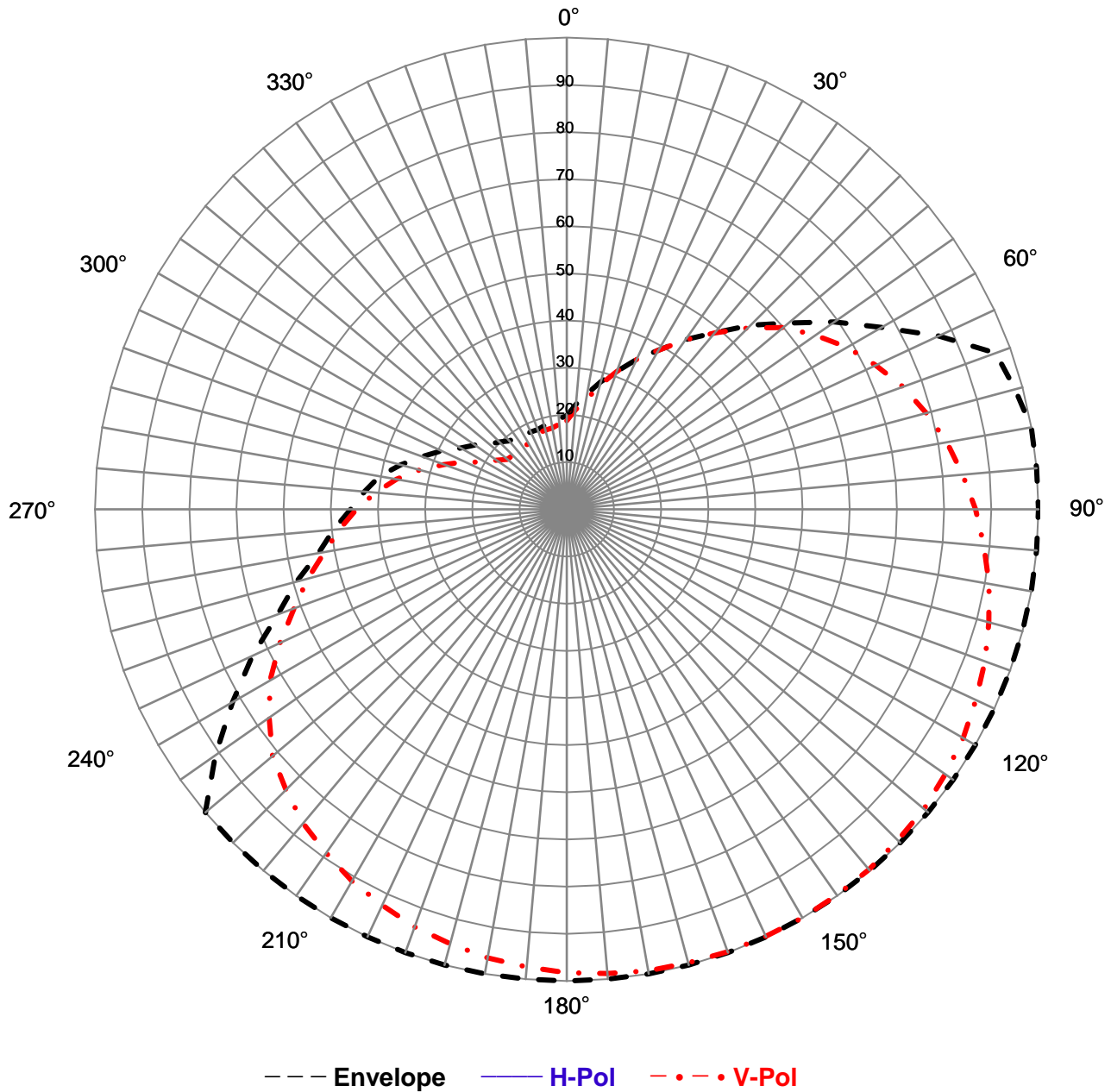
Location: Livingston, CA

Maximum ERP: 13 kW

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.188	0.457	-3.40
10	0.235	0.716	-1.45
20	0.311	1.260	1.00
30	0.389	1.967	2.94
40	0.488	3.096	4.91
50	0.599	4.671	6.69
60	0.687	6.133	7.88
70	0.759	7.482	8.74
80	0.818	8.706	9.40
90	0.866	9.760	9.89
100	0.909	10.743	10.31
110	0.944	11.573	10.63
120	0.970	12.242	10.88
130	0.988	12.698	11.04
140	0.997	12.913	11.11
150	1.000	13.000	11.14
160	0.998	12.949	11.12
170	0.993	12.825	11.08
180	0.982	12.547	10.99
190	0.965	12.113	10.83
200	0.942	11.541	10.62
210	0.910	10.768	10.32
220	0.869	9.816	9.92
230	0.814	8.615	9.35
240	0.726	6.852	8.36
250	0.615	4.917	6.92
260	0.521	3.529	5.48
270	0.446	2.586	4.13
280	0.367	1.748	2.42
290	0.277	1.000	0.00
300	0.199	0.516	-2.87
310	0.164	0.351	-4.55
320	0.160	0.334	-4.77
330	0.161	0.339	-4.70
340	0.172	0.385	-4.14
350	0.175	0.399	-3.99



Relative Field Azimuth Plane Pattern



Pattern Type:	Measured Field
Antenna Model:	PSIFMV-3E-DA
Polarization:	Vertical
Gain (V-pol):	5.80 (7.63 dB)
Frequency:	89.1 MHz

Tower:	Rohn 24-1/4"
Orientation:	150°
Configuration:	Fullwave
Station:	KCJH
Date:	4/28/2019

Measured Relative Field Tabulation

Antenna Model: PSIFMV-3E-DA

Your Christian Companion Network, Inc.

Station: KCJH

Frequency: 89.1 MHz

Location: Livingston, CA

Vertical Polarization

Angle	Relative Field	Power Gain	Gain (dB)
0	0.188	0.204	-6.90
10	0.235	0.319	-4.96
20	0.311	0.562	-2.50
30	0.389	0.878	-0.57
40	0.488	1.381	1.40
50	0.599	2.084	3.19
60	0.687	2.736	4.37
70	0.759	3.338	5.24
80	0.818	3.884	5.89
90	0.866	4.354	6.39
100	0.909	4.793	6.81
110	0.944	5.163	7.13
120	0.970	5.462	7.37
130	0.988	5.665	7.53
140	0.997	5.761	7.61
150	1.000	5.800	7.63
160	0.998	5.777	7.62
170	0.993	5.722	7.58
180	0.982	5.598	7.48
190	0.965	5.404	7.33
200	0.942	5.149	7.12
210	0.910	4.804	6.82
220	0.869	4.380	6.41
230	0.814	3.844	5.85
240	0.726	3.057	4.85
250	0.615	2.194	3.41
260	0.521	1.574	1.97
270	0.446	1.154	0.62
280	0.367	0.780	-1.08
290	0.277	0.446	-3.50
300	0.199	0.230	-6.38
310	0.164	0.157	-8.05
320	0.160	0.149	-8.27
330	0.161	0.151	-8.20
340	0.172	0.172	-7.65
350	0.175	0.178	-7.50

Maximum Value

Field 1.00

Gain 5.80 (7.63 dB)

Azimuth Bearing 150 degrees

Minimum Field

Field 0.160

Gain .149 (-8.27 dB)

Azimuth Bearing 320 degrees

ERP Tabulation

Antenna Model: PSIFMV-3E-DA
Your Christian Companion Network, Inc.
Station: KCJH
Frequency: 89.1 MHz
Location: Livingston, CA
Maximum ERP: 13 kW
Vertical Polarization

Angle	Relative Field	ERP (kW)	ERP (dBk)
0	0.188	0.457	-3.40
10	0.235	0.716	-1.45
20	0.311	1.260	1.00
30	0.389	1.967	2.94
40	0.488	3.096	4.91
50	0.599	4.671	6.69
60	0.687	6.133	7.88
70	0.759	7.482	8.74
80	0.818	8.706	9.40
90	0.866	9.760	9.89
100	0.909	10.743	10.31
110	0.944	11.573	10.63
120	0.970	12.242	10.88
130	0.988	12.698	11.04
140	0.997	12.913	11.11
150	1.000	13.000	11.14
160	0.998	12.949	11.12
170	0.993	12.825	11.08
180	0.982	12.547	10.99
190	0.965	12.113	10.83
200	0.942	11.541	10.62
210	0.910	10.768	10.32
220	0.869	9.816	9.92
230	0.814	8.615	9.35
240	0.726	6.852	8.36
250	0.615	4.917	6.92
260	0.521	3.529	5.48
270	0.446	2.586	4.13
280	0.367	1.748	2.42
290	0.277	1.000	0.00
300	0.199	0.516	-2.87
310	0.164	0.351	-4.55
320	0.160	0.334	-4.77
330	0.161	0.339	-4.70
340	0.172	0.385	-4.14
350	0.175	0.399	-3.99

Maximum Value (V-pol)

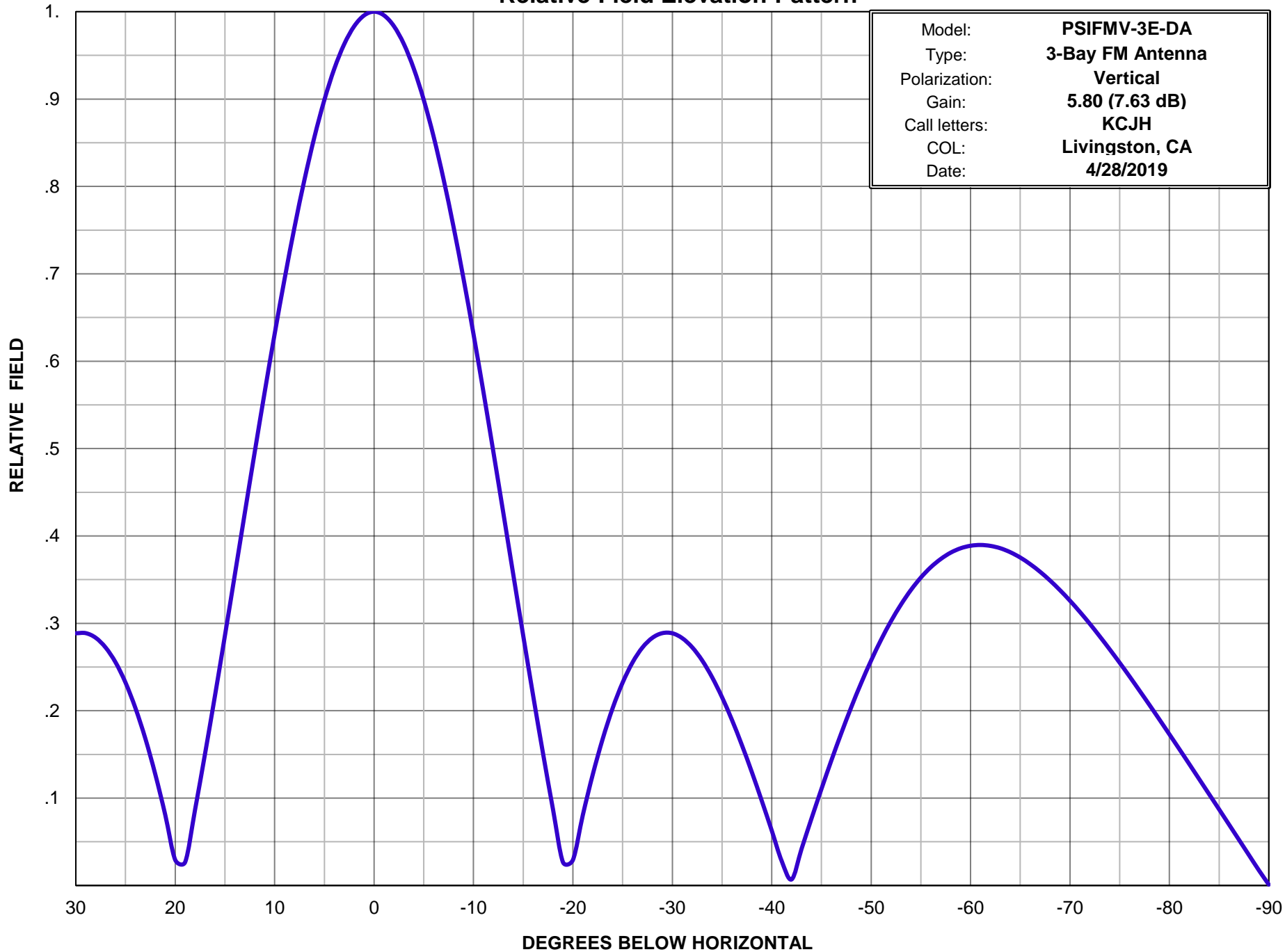
Field 1.00
ERP 13 kW (11.14 dBk)
Azimuth Bearing 150 degrees

Minimum Field (V-pol)

Field 0.160
ERP .33 kW (-4.77 dBk)
Azimuth Bearing 320 degrees



Relative Field Elevation Pattern



Propagation Systems Inc.

Relative Field Tabulation Elevation Pattern

Antenna Model: PSIFMV-3E-DA

Gain: 5.80 (7.63 dBd)

Station: KCJH

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-90	0.001	-60.00	-50	0.258	-11.78	-10	0.631	-4.00
-89	0.017	-35.18	-49	0.232	-12.70	-9	0.694	-3.17
-88	0.035	-29.16	-48	0.204	-13.80	-8	0.753	-2.46
-87	0.052	-25.63	-47	0.174	-15.17	-7	0.808	-1.85
-86	0.070	-23.14	-46	0.143	-16.88	-6	0.857	-1.35
-85	0.087	-21.20	-45	0.110	-19.14	-5	0.899	-0.93
-84	0.104	-19.63	-44	0.077	-22.31	-4	0.935	-0.59
-83	0.122	-18.30	-43	0.042	-27.54	-3	0.963	-0.33
-82	0.139	-17.14	-42	0.007	-43.14	-2	0.983	-0.15
-81	0.156	-16.13	-41	0.028	-31.05	-1	0.996	-0.04
-80	0.173	-15.24	-40	0.063	-24.03	0	1.000	0.00
-79	0.190	-14.43	-39	0.097	-20.28	1	0.996	-0.04
-78	0.207	-13.70	-38	0.130	-17.74	2	0.983	-0.15
-77	0.223	-13.04	-37	0.161	-15.88	3	0.963	-0.33
-76	0.239	-12.43	-36	0.189	-14.45	4	0.935	-0.59
-75	0.255	-11.87	-35	0.215	-13.33	5	0.899	-0.93
-74	0.270	-11.37	-34	0.238	-12.46	6	0.857	-1.35
-73	0.285	-10.90	-33	0.258	-11.78	7	0.808	-1.85
-72	0.299	-10.48	-32	0.273	-11.29	8	0.753	-2.46
-71	0.313	-10.09	-31	0.283	-10.96	9	0.694	-3.17
-70	0.326	-9.74	-30	0.289	-10.79	10	0.631	-4.00
-69	0.338	-9.42	-29	0.289	-10.79	11	0.565	-4.96
-68	0.349	-9.14	-28	0.283	-10.95	12	0.496	-6.08
-67	0.359	-8.90	-27	0.272	-11.30	13	0.427	-7.40
-66	0.368	-8.69	-26	0.255	-11.86	14	0.356	-8.97
-65	0.375	-8.51	-25	0.232	-12.69	15	0.286	-10.87
-64	0.381	-8.37	-24	0.203	-13.85	16	0.217	-13.25
-63	0.386	-8.27	-23	0.168	-15.50	17	0.151	-16.43
-62	0.389	-8.21	-22	0.127	-17.92	18	0.087	-21.20
-61	0.390	-8.19	-21	0.081	-21.86	19	0.027	-31.43
-60	0.389	-8.21	-20	0.029	-30.68	20	0.029	-30.68
-59	0.386	-8.27	-19	0.027	-31.48	21	0.081	-21.87
-58	0.381	-8.38	-18	0.087	-21.21	22	0.127	-17.93
-57	0.374	-8.55	-17	0.151	-16.43	23	0.168	-15.50
-56	0.364	-8.77	-16	0.217	-13.26	24	0.203	-13.86
-55	0.352	-9.06	-15	0.286	-10.87	25	0.232	-12.69
-54	0.338	-9.42	-14	0.356	-8.97	26	0.255	-11.86
-53	0.322	-9.86	-13	0.426	-7.40	27	0.272	-11.30
-52	0.303	-10.38	-12	0.496	-6.09	28	0.283	-10.95
-51	0.281	-11.02	-11	0.565	-4.96	29	0.289	-10.79