

**S.O. 38336**

**Report of Test SLV-4-SS(0.75)-OFFSET-DA**

**for**

**Cochise Broadcasting**

**KXKR 101.1 MHz Catalina Foothills, AZ**

**OBJECTIVE:**

The objective of this test was to demonstrate the directional characteristics of a Test **SLV-4-SS(0.75)-OFFSET-DA** to meet the needs of KXKR and to comply with the requirements of the FCC construction permit, file number 0000179791. This test characterizes only the radiation characteristics of the antenna when mounted on the tower as described. It does not represent or imply any guarantee of specific coverage which can be influenced by factors beyond the scope of this test.

**RESULTS:**

The following Figures are the results of the measurements from our pattern range:

- Figure 1A - Measured Azimuth Pattern with the FCC Composite
- Figure 1B - Measured Composite Azimuth Pattern with the FCC Composite
- Figure 1C - Tabulation of the Horizontal Polarization for the Measured Azimuth Pattern
- Figure 1D - Tabulation of the Vertical Polarization for the Measured Azimuth Pattern
- Figure 1E - Tabulation of the Measured Composite Azimuth Pattern
- Figure 1F - Tabulation of the FCC Composite

The calculated elevation pattern of the antenna is shown in Figure 3.

Construction permit file number 0000179791 indicates that the Horizontal radiation component shall not exceed 11.5 kW at any azimuth and is restricted to the following values at the azimuths specified:

210 to 230 Degrees True: 0.145 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 30 Degrees True. At the restricted azimuths of 210 to 230 Degrees True the Horizontal component is 21.31 dB down from the maximum of 11.5 kW, or 0.085 kW.

The R.M.S. of the Horizontal component is 0.608. The total Horizontal power gain is 5.165. The R.M.S. of the Vertical component is 0.598. The total Vertical power gain is 4.760. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.698. The R.M.S. of the measured composite pattern is 0.612. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.593. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

#### **METHOD OF DIRECTIONALIZATION:**

Two levels of the Test **SLV-4-SS(0.75)-OFFSET-DA** were mounted on a tower of precise scale to the tower at the KXKR site. The spacing of the antennas to the tower was varied along with horizontal parasitic elements to achieve the horizontal and vertical patterns shown in Figure 1A. See Figure 2 for mechanical details.

#### **METHOD OF MEASUREMENT:**

As allowed by the construction permit, file number 0000179791, two levels of the Test **SLV-4-SS(0.75)-OFFSET-DA** were set up on the Shively Labs scale model antenna pattern measuring range. A scale of 4.5:1 was used.

#### **EQUIPMENT:**

The 4.5:1 scale model pattern range consists of a wooden rotating pedestal equipped with a position indicator. The scale model bay is placed on the top of this pedestal and is used in the transmission mode at approximately 20 feet above ground level. The receiving corner reflector is spaced 50 feet away from the rotating pedestal at the same level above ground as the transmitting model. The transmitting and receiving signals are carried to a control building by means of RG-9/U double shielded coax cable.

The control building is equipped with:

Hewlett Packard Model 4395-A Network Analyzer

PC Based Controller

Output Standard Printer or 'pdf'

All testing is carried out in strict accordance with approved procedures under our ISO9001.

**TEST PROCEDURES:**

The receiving antenna system is mounted so that the horizontal and vertical azimuth patterns are measured independently. The network analyzer was set to 454.95 MHz Calibrated pads are used to check the linearity of the measuring system. For example, 6 dB padding yields a scale reading of 50 from an unpadded reading of 100 in voltage. From the recorded patterns, the R.M.S. values are calculated and recorded as shown in Figure 1A.

Respectfully submitted by:

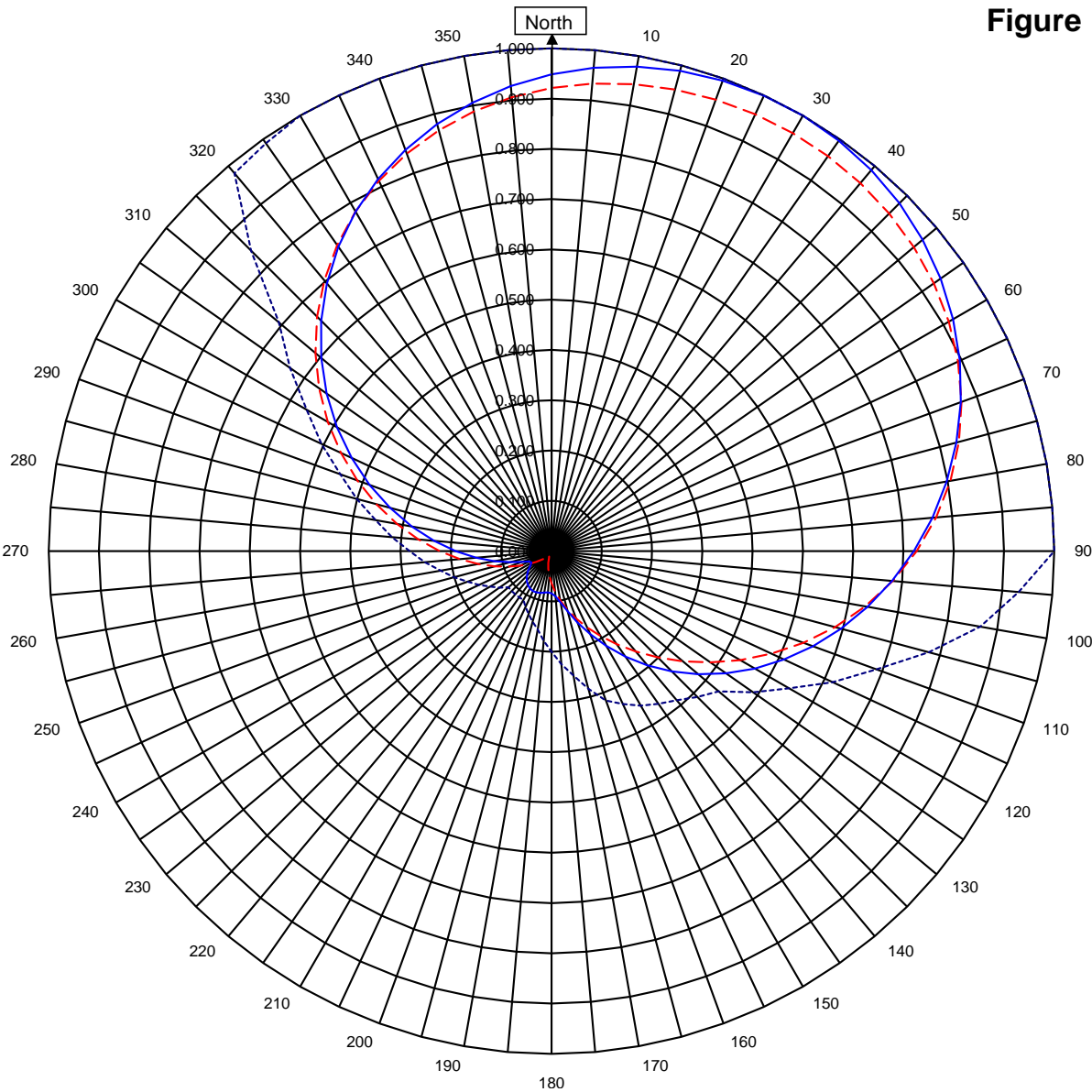
A handwritten signature in black ink, reading "Sean C. Edwards". The signature is written in a cursive, flowing style.

Sean C Edwards  
Director RF Engineering, Shively Labs  
S/O 38336  
Date 3/4/2022

# Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1A



**KXKR      Catalina Foothills, AZ**

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February 12, 2022

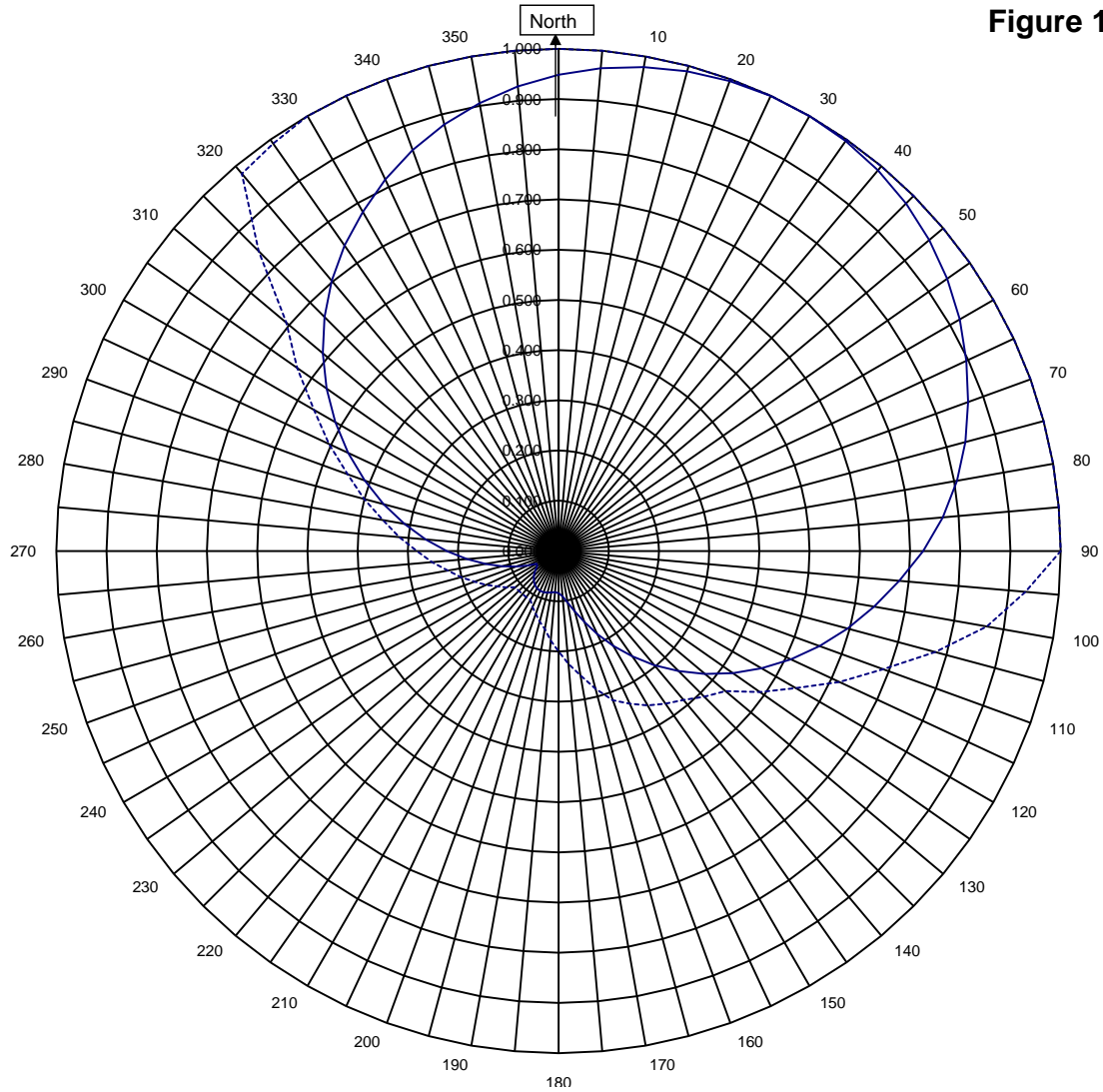
Horizontal RMS	0.608	Frequency	101.1 / 454.95 MHz
Vertical RMS	0.598	Plot	Relative Field
H/V Composite RMS	0.612	Scale	4.5 : 1
FCC Composite RMS	0.698	See Figure 2 for Mechanical Details	

Antenna Model	SLV-4-SS-DA
Pattern Type	Directional Azimuth
Pattern Number	AA3

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**Figure 1B**



**KXKR Catalina Foothills, Ai**

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February 12, 2022

————— H/V Composite RMS	0.612
..... FCC Composite RMS	0.698

Frequency	101.1 / 454.95 MHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	SLV-4-SS-DA
Pattern Type	Directional H/V Composite
Pattern Number	AA3

Figure 1C

Tabulation of Horizontal Azimuth Pattern  
KXKR Catalina Foothills, AZ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.948	180	0.084
10	0.978	190	0.084
20	0.996	200	0.087
30	1.000	210	0.086
40	0.990	220	0.076
45	0.979	225	0.069
50	0.964	230	0.060
60	0.922	240	0.046
70	0.866	250	0.062
80	0.798	260	0.115
90	0.721	270	0.191
100	0.638	280	0.282
110	0.553	290	0.385
120	0.467	300	0.493
130	0.381	310	0.598
135	0.338	315	0.648
140	0.297	320	0.695
150	0.218	325	0.739
160	0.151	330	0.779
170	0.104	340	0.849
		350	0.906

Figure 1D

Tabulation of Vertical Azimuth Pattern  
KXKR Catalina Foothills, AZ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.921	180	0.064
10	0.943	190	0.035
20	0.956	200	0.015
30	0.960	210	0.011
40	0.956	220	0.017
45	0.950	225	0.022
50	0.941	230	0.028
60	0.912	240	0.050
70	0.868	250	0.090
80	0.806	260	0.148
90	0.726	270	0.222
100	0.634	280	0.312
110	0.533	290	0.411
120	0.433	300	0.514
130	0.341	310	0.613
135	0.299	315	0.659
140	0.261	320	0.703
150	0.195	325	0.743
160	0.142	330	0.780
170	0.100	340	0.841
		350	0.888

Figure 1E

Tabulation of Composite Azimuth Pattern  
KXKR Catalina Foothills, AZ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.948	180	0.084
10	0.978	190	0.084
20	0.996	200	0.087
30	1.000	210	0.086
40	0.990	220	0.076
45	0.979	225	0.069
50	0.964	230	0.060
60	0.922	240	0.050
70	0.868	250	0.090
80	0.806	260	0.148
90	0.726	270	0.222
100	0.638	280	0.312
110	0.553	290	0.411
120	0.467	300	0.514
130	0.381	310	0.613
135	0.338	315	0.659
140	0.297	320	0.703
150	0.218	325	0.743
160	0.151	330	0.780
170	0.104	340	0.849
		350	0.906

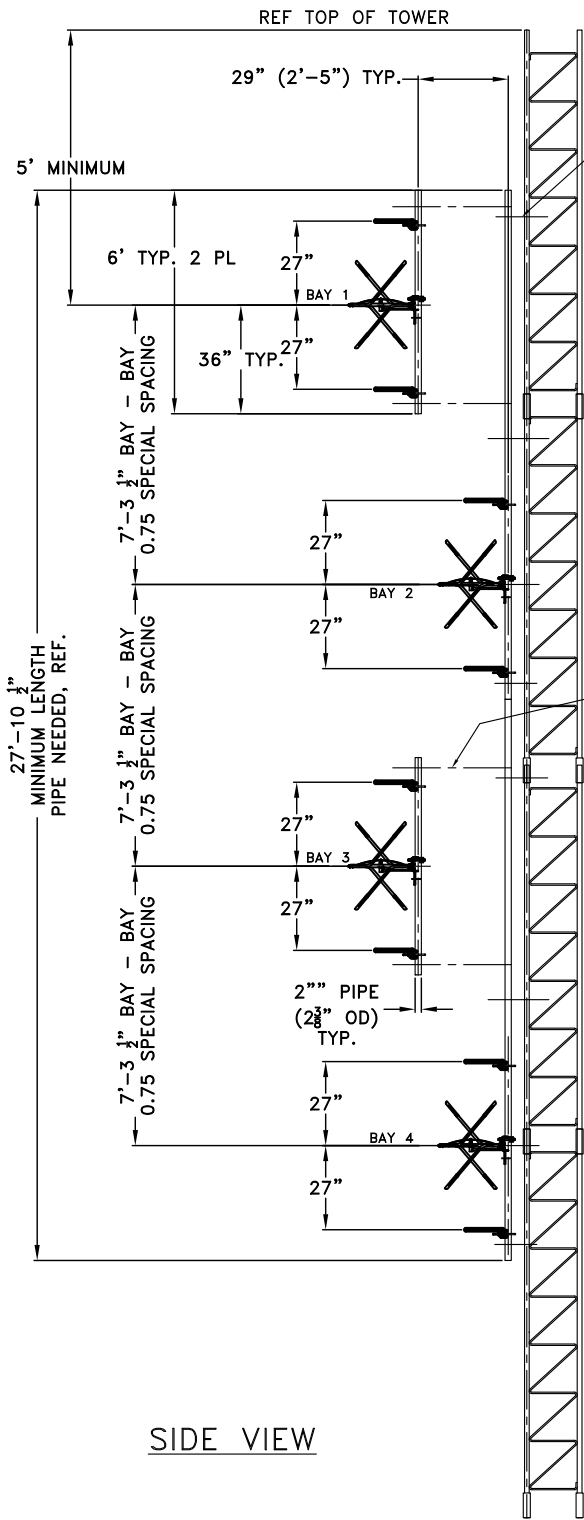


Figure 1F

Tabulation of FCC Directional Composite  
KXKR Catalina Foothills, AZ

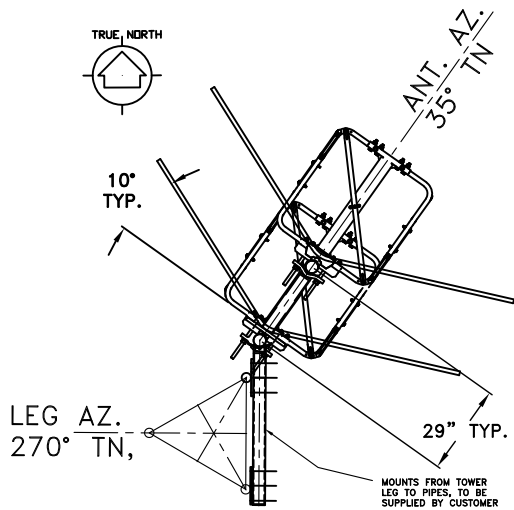
Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.200
10	1.000	190	0.158
20	1.000	200	0.133
30	1.000	210	0.112
40	1.000	220	0.112
50	1.000	230	0.112
60	1.000	240	0.141
70	1.000	250	0.178
80	1.000	260	0.224
90	1.000	270	0.282
100	0.866	280	0.355
110	0.688	290	0.447
120	0.546	300	0.562
130	0.434	310	0.708
140	0.387	320	0.981
150	0.355	325	1.000
160	0.316	330	1.000
170	0.251	340	1.000
		350	1.000

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
-			



MOUNTS FROM TOWER  
LEG TO PIPES, TO BE  
SUPPLIED BY CUSTOMER

MOUNTS FROM PIPE  
TO PIPE, TO BE  
SUPPLIED BY CUSTOMER



TOP VIEW  
TOWER MAKE:  
ROHN 45

ANTENNA HEADING = 35° TN

		FREQ. MHz: 101.1		SHIVELY LABS	
		STATION: KXKR		A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE	
		C.O.L.: CATALINA FOOTHILLS AZ		TYPE SLV-4-.75SS ANTENNA	
		S/N: 38336-1		INSTALLATION DRAWING	
PREPARED ASP	DATE 2/23/22	S.O.: 38336-1		CODE IDENT NO D 26750	DWG. NO. FIGURE 2
CHECKED SCE	DATE 2/23/22	C.O.: N/A		SCALE: NTS	REV -
ENGINEER				SHEET 1 OF 1	

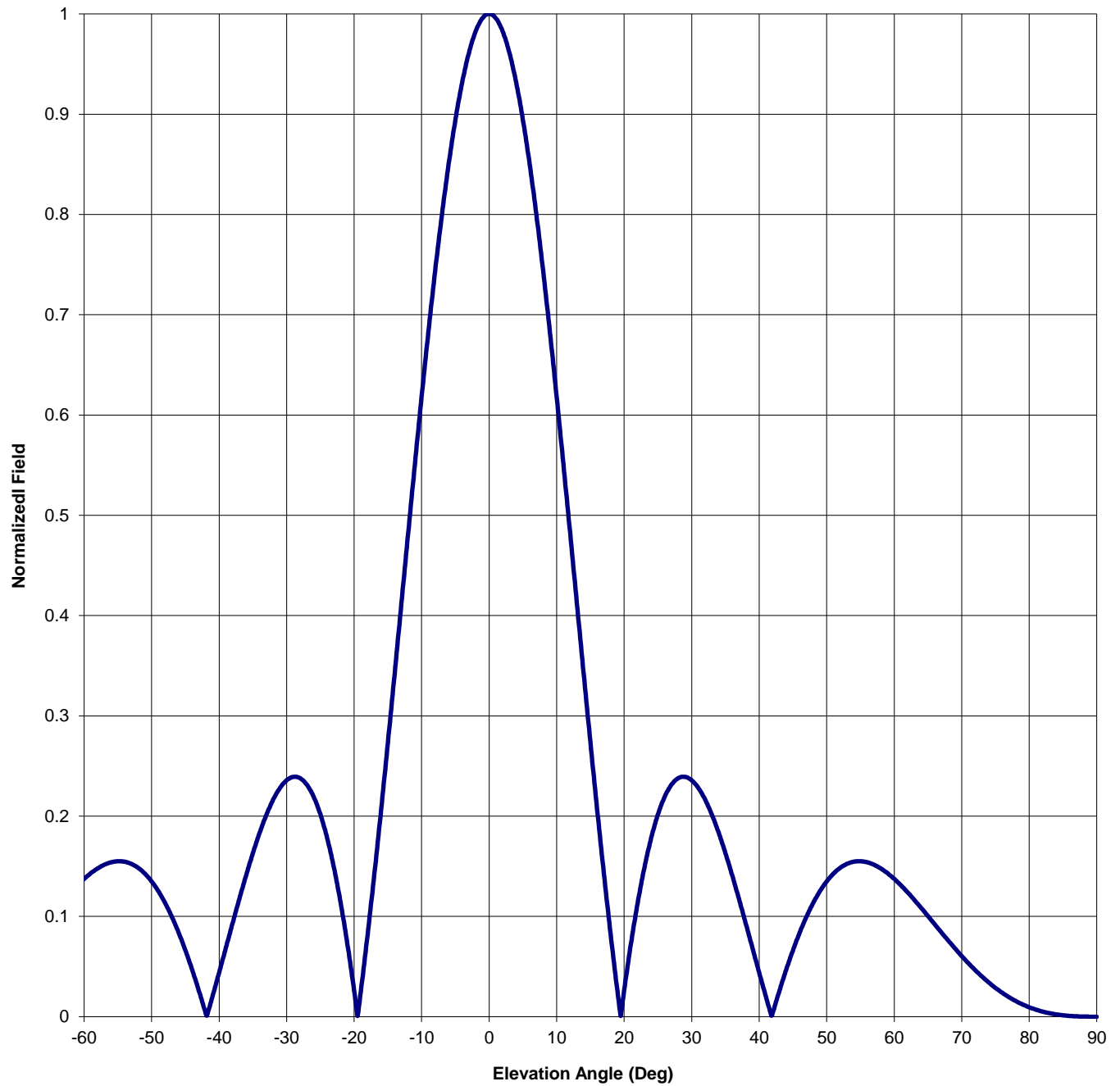
Antenna Mfg.: Shively Labs  
Antenna Type: SLV-4-SS-OFFSET-DA

Date: 3/4/2022

Station: KXKR  
Frequency: 101.1  
Channel #: 266

Beam Tilt	0	
Gain (Max)	5.165	7.131 dB
Gain (Horizon)	5.165	7.131 dB

Figure: Figure 3



Antenna Mfg.: Shively Labs  
Antenna Type: SLV-4-SS-OFFSET-DA

Date: 3/4/2022

Station: KXKR  
Frequency: 101.1  
Channel #: 266

Beam Tilt 0  
Gain (Max) 5.165  
Gain (Horizon) 5.165

7.131 dB  
7.131 dB

Figure: Figure 3

Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field
-90	0.000	-44	0.047	0	1.000	46	0.084
-89	0.000	-43	0.026	1	0.996	47	0.100
-88	0.000	-42	0.004	2	0.983	48	0.113
-87	0.000	-41	0.020	3	0.961	49	0.125
-86	0.001	-40	0.044	4	0.932	50	0.135
-85	0.001	-39	0.069	5	0.894	51	0.143
-84	0.002	-38	0.093	6	0.850	52	0.148
-83	0.004	-37	0.118	7	0.800	53	0.152
-82	0.005	-36	0.141	8	0.744	54	0.155
-81	0.007	-35	0.163	9	0.683	55	0.155
-80	0.009	-34	0.183	10	0.618	56	0.154
-79	0.012	-33	0.201	11	0.551	57	0.152
-78	0.016	-32	0.216	12	0.482	58	0.148
-77	0.020	-31	0.228	13	0.412	59	0.143
-76	0.024	-30	0.236	14	0.342	60	0.137
-75	0.029	-29	0.239	15	0.273	61	0.131
-74	0.034	-28	0.238	16	0.207	62	0.124
-73	0.040	-27	0.231	17	0.143	63	0.116
-72	0.046	-26	0.219	18	0.082	64	0.109
-71	0.053	-25	0.202	19	0.026	65	0.100
-70	0.061	-24	0.178	20	0.026	66	0.092
-69	0.068	-23	0.149	21	0.073	67	0.084
-68	0.076	-22	0.114	22	0.114	68	0.076
-67	0.084	-21	0.073	23	0.149	69	0.068
-66	0.092	-20	0.026	24	0.178	70	0.061
-65	0.100	-19	0.026	25	0.202	71	0.053
-64	0.109	-18	0.082	26	0.219	72	0.046
-63	0.116	-17	0.143	27	0.231	73	0.040
-62	0.124	-16	0.207	28	0.238	74	0.034
-61	0.131	-15	0.273	29	0.239	75	0.029
-60	0.137	-14	0.342	30	0.236	76	0.024
-59	0.143	-13	0.412	31	0.228	77	0.020
-58	0.148	-12	0.482	32	0.216	78	0.016
-57	0.152	-11	0.551	33	0.201	79	0.012
-56	0.154	-10	0.618	34	0.183	80	0.009
-55	0.155	-9	0.683	35	0.163	81	0.007
-54	0.155	-8	0.744	36	0.141	82	0.005
-53	0.152	-7	0.800	37	0.118	83	0.004
-52	0.148	-6	0.850	38	0.093	84	0.002
-51	0.143	-5	0.894	39	0.069	85	0.001
-50	0.135	-4	0.932	40	0.044	86	0.001
-49	0.125	-3	0.961	41	0.020	87	0.000
-48	0.113	-2	0.983	42	0.004	88	0.000
-47	0.100	-1	0.996	43	0.026	89	0.000
-46	0.084	0	1.000	44	0.047	90	0.000
-45	0.066			45	0.066		

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Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KXKR Catalina Foothills, AZ

MODEL SLV-4-SS(0.75)-OFFSET-DA

Elevation Gain of Antenna 1.877

Horizontal RMS value divided by the Vertical RMS value equals the Horiz. - Vert. Ratio

H RMS 0.608167 V RMS 0.597503 H/V Ratio 1.018

Elevation Gain of Horizontal Component 1.910

Elevation Gain of Vertical Component 1.844

Horizontal Azimuth Gain equals  $1/(\text{RMS})^2$ . 2.704

Vertical Azimuth Gain equals  $1/(\text{RMS}/\text{Max Vert})^2$ . 2.581  
Max. Vertical 0.96

**\*Total Horizontal Power Gain is the Elevation Gain Times the Azimuth Gain**

Total Horizontal Power Gain = 5.165

**\*Total Vertical Power Gain is the Elevation Gain Times the Azimuth Gain**

Total Vertical Power Gain = 4.760

=====

ERP divided by Horizontal Power Gain equals Antenna Input Power

11.5 kW ERP Divided by H Gain 5.165 equals 2.226 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

2.226 kW Times V Gain 4.760 equals 10.598 kW V ERP

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP

$(0.96)^2$  Times 11.50 Equals 10.598 kW Vertical ERP

NOTE: Calculating the ERP of the Vertical Component by two methods validates the total power gain calculations