

**S.O. 35731**  
**Report of Test 6025-1-DA**  
**for**  
**SOUTHERN NEVEDA EDUCATIONAL BROADCASTERS**  
**KVKL 91.1 MHz LAS VEGAS, NV.**

**OBJECTIVE:**

The objective of this test was to demonstrate the directional characteristics of a 6025-1-DA to meet the needs of KVKL and to comply with the requirements of the FCC construction permit, file number BMXPED-20170602ABC. 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 BMXPED-20170602ABC indicates that the Horizontal radiation component shall not exceed 0.230 kW at any azimuth and is restricted to the following values at the azimuths specified:

60 Degrees True: 0.0074 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 312 Degrees True to 319 Degrees True. At the restricted azimuth of 60 Degrees True through 200 degrees true the Horizontal component is 19.25 dB down from the maximum of 0.230 kW, or 0.003 kW.

The R.M.S. of the Horizontal component is 0.412. The total Horizontal power gain is 2.807. The R.M.S. of the Vertical component is 0.475. The total Vertical power gain is 2.723. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.525. The R.M.S. of the measured composite pattern is 0.478. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.445. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

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

One level of the 6025-1-DA was mounted to a precise scale of a 2-inch pole, off set from the SSOE (tapered tower) at the KVKL site. The 6025-1-DA is attached to 2-inch pole and the spacing of the pole to the tower was varied to achieve the horizontal and vertical pattern shown in Figure 1A. See Figure 2 for mechanical details.

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

As allowed by the construction permit, file number BMXPED-20170602ABC, the 6025-1-DA was 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

Computer Conversions Digital Positioner 0 to 359 degrees

Output Standard Printer or 'pdf'

All testing is carried out in strict accordance with approved procedures under our ISO9001:2008.

**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 409.95 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 unpadding 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:

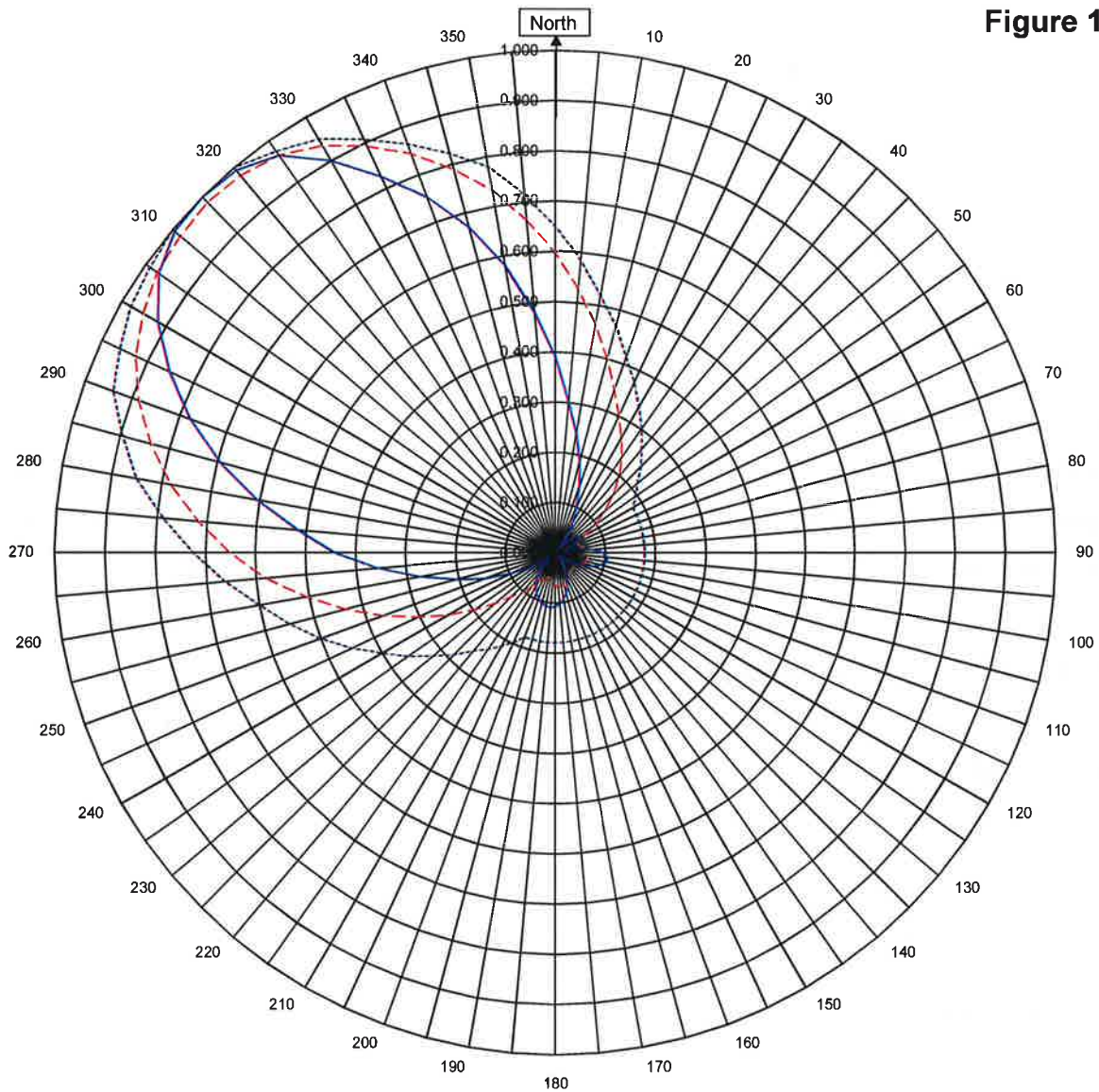


Vice President, Shively Labs  
S/O 35731  
Date July 2, 2018

# Shively Labs

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

Figure 1A



**KVKL**

**LAS VEGAS, NV.**

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July 2, 2018

Horizontal RMS	0.412
Vertical RMS	0.475
H/V Composite RMS	0.478
FCC Composite RMS	0.525

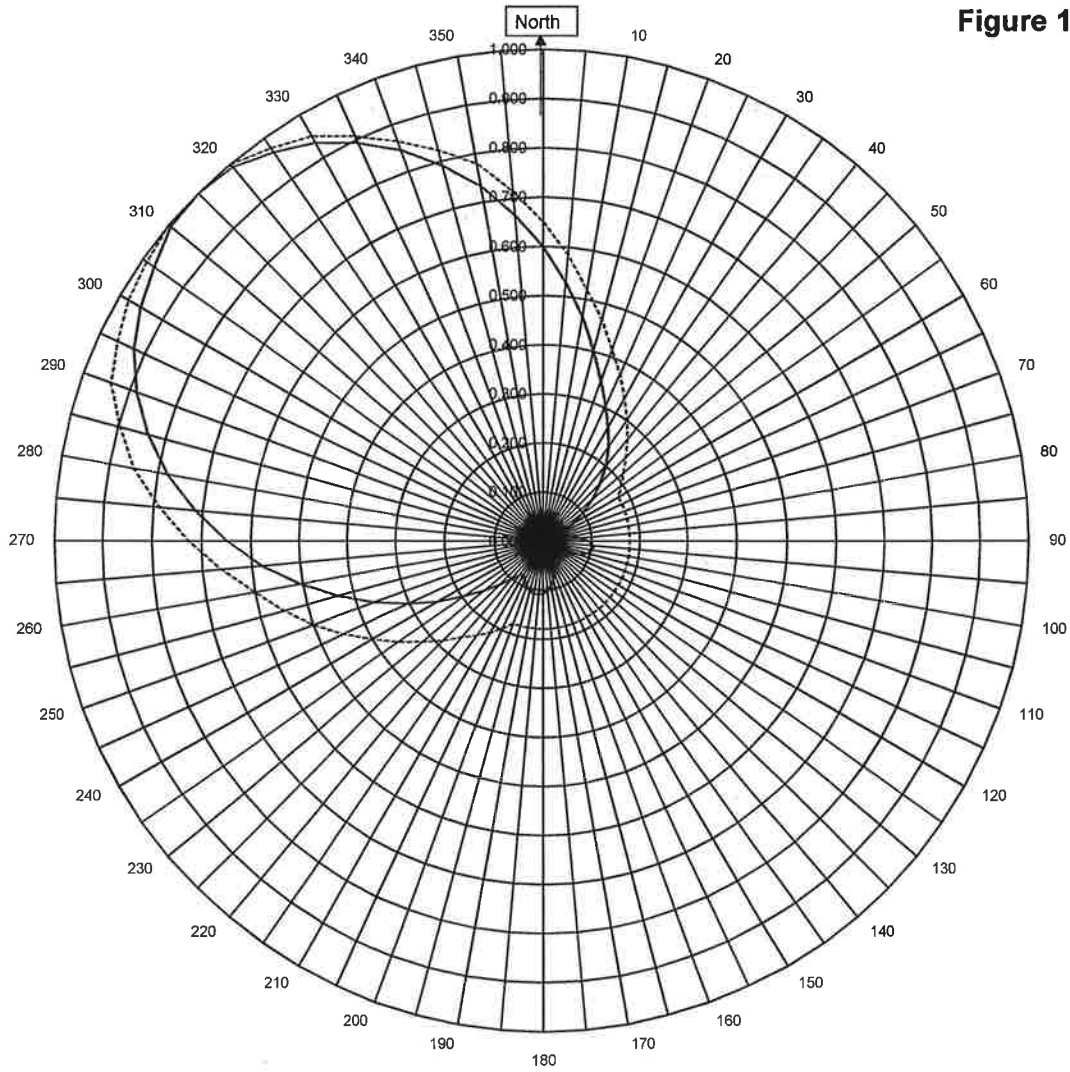
Frequency	91.1 / 409.95 MHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	6025-1-DA
Pattern Type	Directional Azimuth

# Shively Labs

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

Figure 1B



**KVKL LAS VEGAS, NV.**

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July 2, 2018

_____ H/V Composite RMS	0.478
..... FCC Composite RMS	0.525

Frequency	91.1 / 409.95 MHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	6025-1-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern  
KVKL LAS VEGAS, NV.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.391	180	0.107
10	0.242	190	0.107
20	0.140	200	0.097
30	0.067	210	0.078
40	0.014	220	0.056
45	0.029	225	0.039
50	0.048	230	0.021
60	0.055	240	0.047
70	0.025	250	0.149
80	0.046	260	0.276
90	0.095	270	0.443
100	0.104	280	0.604
110	0.080	290	0.778
120	0.038	300	0.919
130	0.008	310	0.995
135	0.006	315	1.000
140	0.015	320	0.993
150	0.039	330	0.901
160	0.071	340	0.753
170	0.093	350	0.581

Figure 1D

Tabulation of Vertical Azimuth Pattern  
KVKL LAS VEGAS, NV.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.599	180	0.063
10	0.465	190	0.054
20	0.348	200	0.053
30	0.267	210	0.062
40	0.203	220	0.101
45	0.167	225	0.124
50	0.133	230	0.157
60	0.071	240	0.248
70	0.047	250	0.365
80	0.057	260	0.505
90	0.064	270	0.648
100	0.065	280	0.780
110	0.060	290	0.885
120	0.052	300	0.951
130	0.046	310	0.979
135	0.045	315	0.985
140	0.046	320	0.979
150	0.053	330	0.935
160	0.063	340	0.846
170	0.068	350	0.733

Figure 1E

Tabulation of Composite Azimuth Pattern  
KVKL LAS VEGAS, NV.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.599	180	0.107
10	0.465	190	0.107
20	0.348	200	0.097
30	0.267	210	0.078
40	0.203	220	0.101
45	0.167	225	0.124
50	0.133	230	0.157
60	0.071	240	0.248
70	0.047	250	0.365
80	0.057	260	0.505
90	0.095	270	0.648
100	0.104	280	0.780
110	0.080	290	0.885
120	0.052	300	0.951
130	0.046	310	0.995
135	0.045	315	1.000
140	0.046	320	0.993
150	0.053	330	0.935
160	0.071	340	0.846
170	0.093	350	0.733



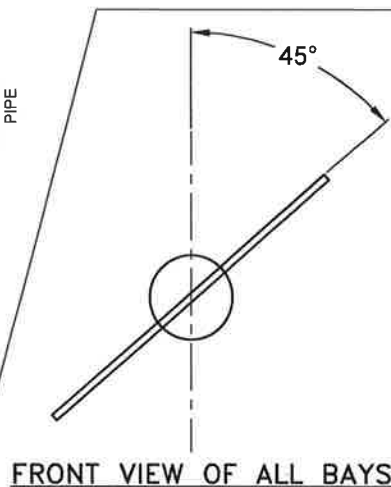
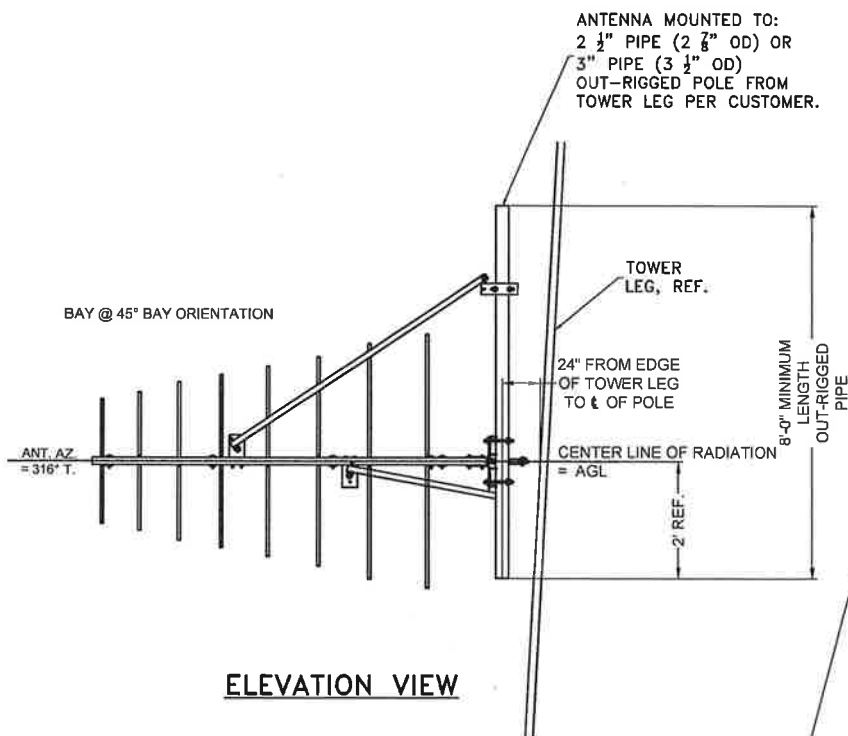
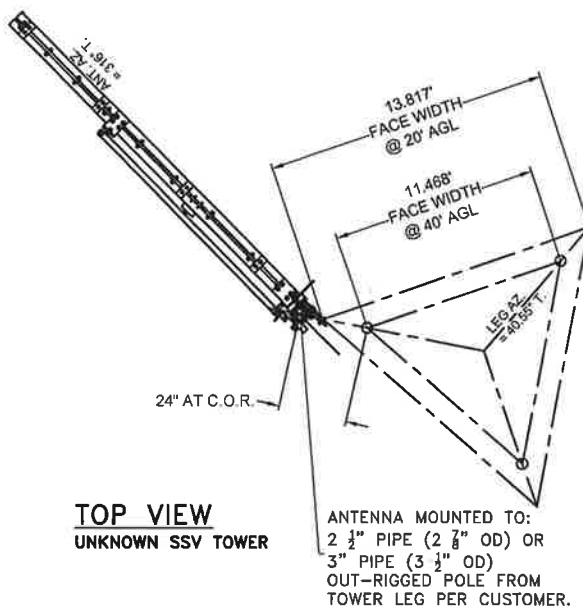
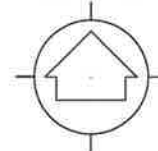
Figure 1F

Tabulation of FCC Directional Composite  
KVKL LAS VEGAS, NV.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.650	180	0.179
10	0.520	190	0.179
20	0.415	200	0.179
30	0.335	210	0.215
40	0.270	220	0.255
50	0.215	230	0.320
60	0.179	240	0.400
70	0.179	250	0.500
80	0.179	260	0.600
90	0.179	270	0.725
100	0.179	280	0.850
110	0.179	290	0.940
120	0.179	300	0.980
130	0.179	310	1.000
140	0.179	320	1.000
150	0.179	330	0.950
160	0.179	340	0.865
170	0.179	350	0.780

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A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE

SHOP ORDER:

35731

FREQUENCY:

91.1

SCALE:

N.T.S.

DRAWN BY:

ASP

APPROVED BY:

DAB

TITLE:

**FIGURE 2, KVKL, 91.1 MHz  
MODEL 6025-1-SLANT(45°)-DA**

DATE:

2-27-19

**FIGURE 2**

Antenna Mfg.: Shively Labs  
Antenna Type: 6025-1-DA

Date: 7/2/2018

Station: KVKL

Frequency: 91.1

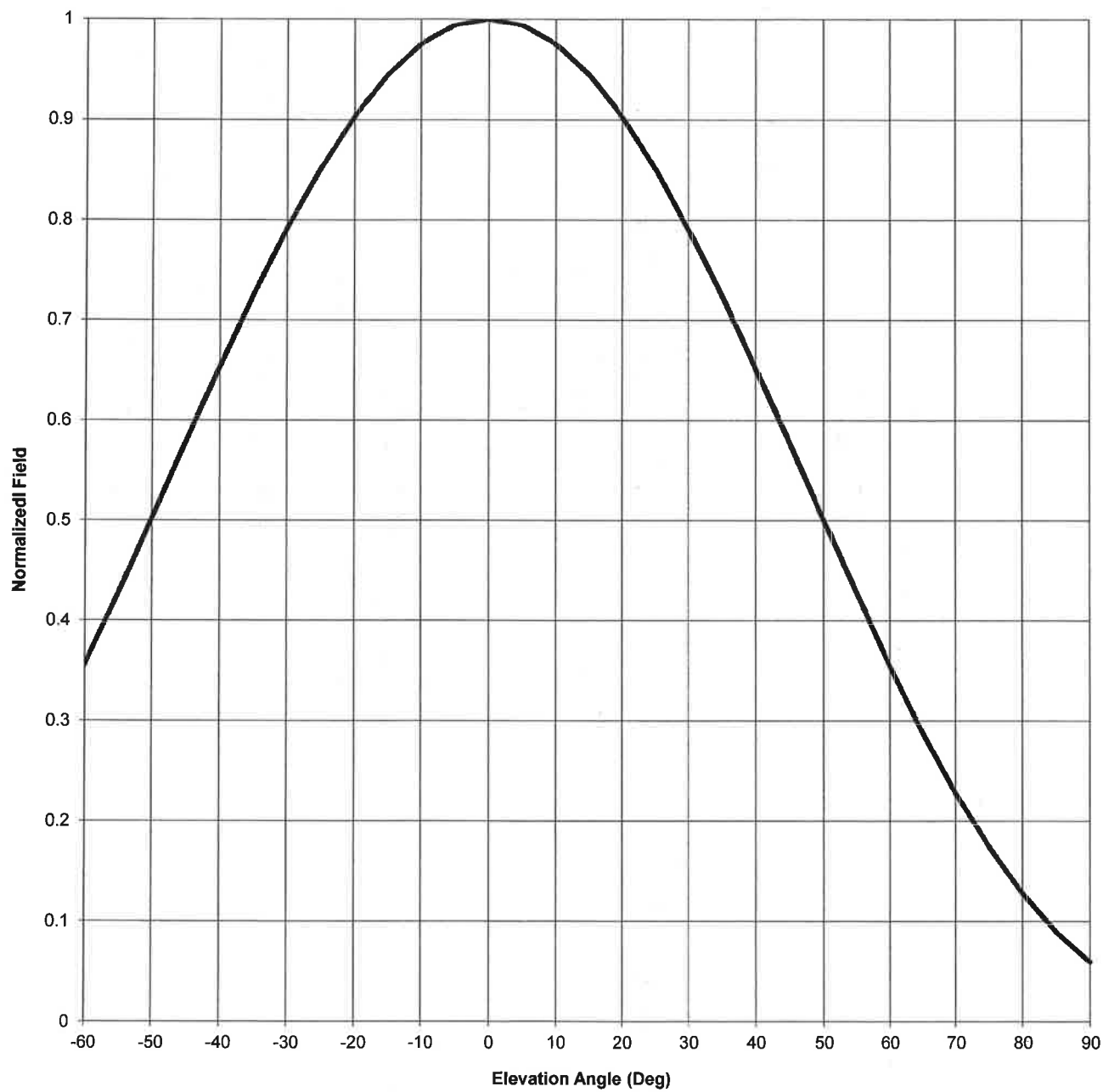
Channel #: 216

Beam Tilt 0

Gain (Max) 2.807 4.482 dB

Gain (Horizon) 2.807 4.482 dB

Figure: Figure 3



Antenna Mfg.: Shively Labs  
Antenna Type: 6025-1-DA

Date: 7/2/2018

Station: KVKL  
Frequency: 91.1  
Channel #: 216

Beam Tilt 0  
Gain (Max) 2.807 4.482 dB  
Gain (Horizon) 2.807 4.482 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	0.059	-44	0.593	0	1.000	46	0.561
-89	0.066	-43	0.608	1	0.999	47	0.546
-88	0.072	-42	0.623	2	0.997	48	0.531
-87	0.078	-41	0.638	3	0.996	49	0.515
-86	0.084	-40	0.653	4	0.995	50	0.500
-85	0.090	-39	0.667	5	0.994	51	0.485
-84	0.097	-38	0.682	6	0.990	52	0.471
-83	0.105	-37	0.696	7	0.986	53	0.456
-82	0.113	-36	0.710	8	0.983	54	0.441
-81	0.120	-35	0.725	9	0.979	55	0.426
-80	0.128	-34	0.738	10	0.975	56	0.412
-79	0.137	-33	0.752	11	0.969	57	0.397
-78	0.146	-32	0.765	12	0.963	58	0.383
-77	0.156	-31	0.778	13	0.957	59	0.369
-76	0.165	-30	0.792	14	0.951	60	0.355
-75	0.174	-29	0.804	15	0.944	61	0.341
-74	0.185	-28	0.816	16	0.936	62	0.328
-73	0.196	-27	0.828	17	0.928	63	0.315
-72	0.206	-26	0.840	18	0.919	64	0.301
-71	0.217	-25	0.852	19	0.911	65	0.288
-70	0.228	-24	0.862	20	0.903	66	0.276
-69	0.240	-23	0.872	21	0.892	67	0.264
-68	0.252	-22	0.883	22	0.882	68	0.252
-67	0.265	-21	0.893	23	0.872	69	0.240
-66	0.277	-20	0.903	24	0.861	70	0.228
-65	0.289	-19	0.911	25	0.851	71	0.217
-64	0.302	-18	0.920	26	0.839	72	0.206
-63	0.316	-17	0.928	27	0.827	73	0.195
-62	0.329	-16	0.936	28	0.815	74	0.185
-61	0.343	-15	0.945	29	0.803	75	0.174
-60	0.356	-14	0.951	30	0.791	76	0.165
-59	0.370	-13	0.957	31	0.777	77	0.156
-58	0.385	-12	0.963	32	0.764	78	0.146
-57	0.399	-11	0.969	33	0.750	79	0.137
-56	0.413	-10	0.975	34	0.737	80	0.128
-55	0.428	-9	0.979	35	0.723	81	0.120
-54	0.443	-8	0.983	36	0.709	82	0.113
-53	0.458	-7	0.986	37	0.694	83	0.105
-52	0.473	-6	0.990	38	0.680	84	0.097
-51	0.487	-5	0.994	39	0.666	85	0.090
-50	0.502	-4	0.995	40	0.651	86	0.084
-49	0.518	-3	0.996	41	0.636	87	0.078
-48	0.533	-2	0.998	42	0.621	88	0.072
-47	0.548	-1	0.999	43	0.606	89	0.066
-46	0.563	0	1.000	44	0.591	90	0.059
-45	0.578			45	0.576		

## VALIDATION OF TOTAL POWER GAIN CALCULATION

KVKL LAS VEGAS, NV.

MODEL 6025-1-DA

Elevation Gain of Antenna

0.55

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

H RMS 0.412436

V RMS 0.475128

H/V Ratio 0.868

Elevation Gain of Horizontal Component

0.477

Elevation Gain of Vertical Component

0.634

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

5.879

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

4.298

Max. Vertical

0.985

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

Total Horizontal Power Gain =

2.807

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

Total Vertical Power Gain =

2.723

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.23

kW ERP

Divided by H Gain

2.807

equals

0.082

kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.082 kW

Times V Gain

2.723

equals

0.223

kW V ERP

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

 $(0.985)^2$  Times 0.23 Equals 0.223 kW Vertical ERP

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