

**S.O. 30468**

**Report of Test 6025-1-Slant(38°)-DA**

**for**

**Activist San Diego**

**KNSJ 89.1 MHz Descanso, CA**

## **OBJECTIVE:**

The objective of this test was to demonstrate the directional characteristics of a 6025-1-Slant(38°)-DA to meet the needs of KNSJ and to comply with the requirements of the FCC construction permit, file number BNPED-20071022AFB. 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 BNPED-20071022AFB indicates that the Horizontal radiation component shall not exceed 0.33 kW at any azimuth and is restricted to the following values at the azimuths specified:

10 -20      Degrees True (clockwise): 0.018 kilowatts

105 – 110   Degrees True (clockwise): 0.010 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 220 Degrees True to 225 Degrees True. At the restricted azimuth of 10 - 20 Degrees True (clockwise) the Horizontal component is 15.918 dB down from the maximum of 0.33 kW, or 0.008 kW. At the restricted azimuth of 105 - 110 Degrees True (clockwise) the Vertical component is 17.202 dB down from the maximum of 0.33 kW, or 0.006 kW.

The R.M.S. of the Horizontal component is 0.423. The total Horizontal power gain is 2.443. The R.M.S. of the Vertical component is 0.492. The total Vertical power gain is 2.154. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.592. The R.M.S. of the measured composite pattern is 0.504. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.503. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

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

One bay of the 6025-1-Slant(38°)-DA was mounted on a tower of precise scale to the tower at the KNSJ site. The spacing of the antenna to the tower was varied 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 BNPED-20071022AFB, a single level of the 6025-1-Slant(38°)-DA was set up on the Shively Labs scale model antenna pattern measuring range. A scale of 4.5:1 was used.

#### **SUPERVISION:**

Mr. Surette was graduated from Lowell Technological Institute, Lowell, Massachusetts in 1973 with the degree of Bachelor of Science in Electrical Engineering. He has been directly involved with design and development of broadcast antennas, filter systems and RF transmission components since 1974. As an RF Engineer for six years with the original Shively Labs in Raymond, ME and for a short period of time with Dielectric Communications. He is currently an Associate Member of the AFCCE and a Senior Member of IEEE.

He has authored a chapter on filters and combining systems for the latest edition of the CRC Electronics Handbook and for the 9<sup>th</sup> and 10<sup>th</sup> Editions of the NAB Handbook.

**EQUIPMENT:**

The 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 8753 Network Analyzer

PC Based Controller

Hewlett Packard 7550A Graphics Plotter

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 400.95 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:

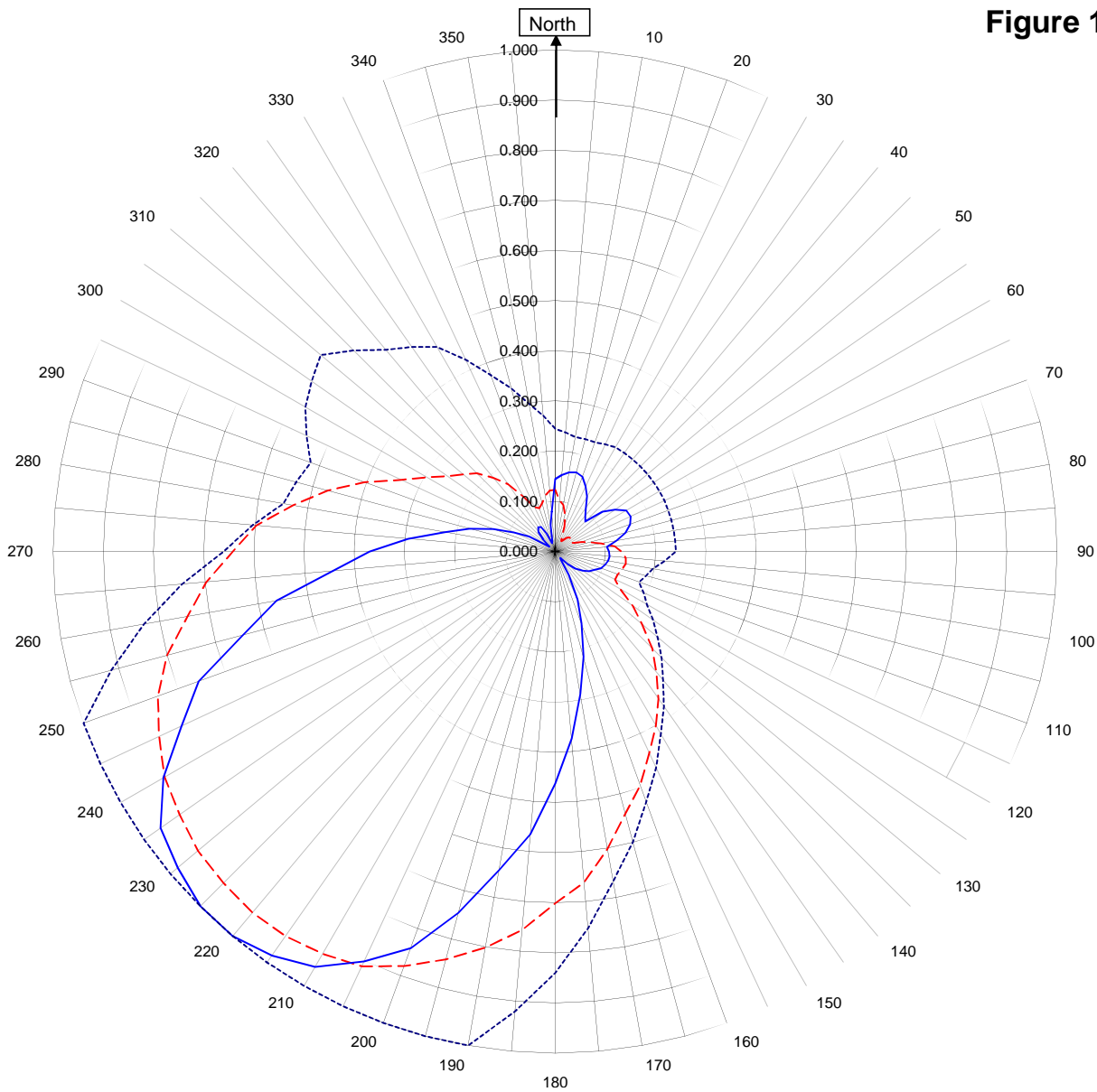


Robert A. Surette  
Director of Sales Engineering  
S/O 30468  
January 31, 2013

# Shively Labs

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

Figure 1A



**KNSJ DESCANSO, CA.**

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January 31, 2013

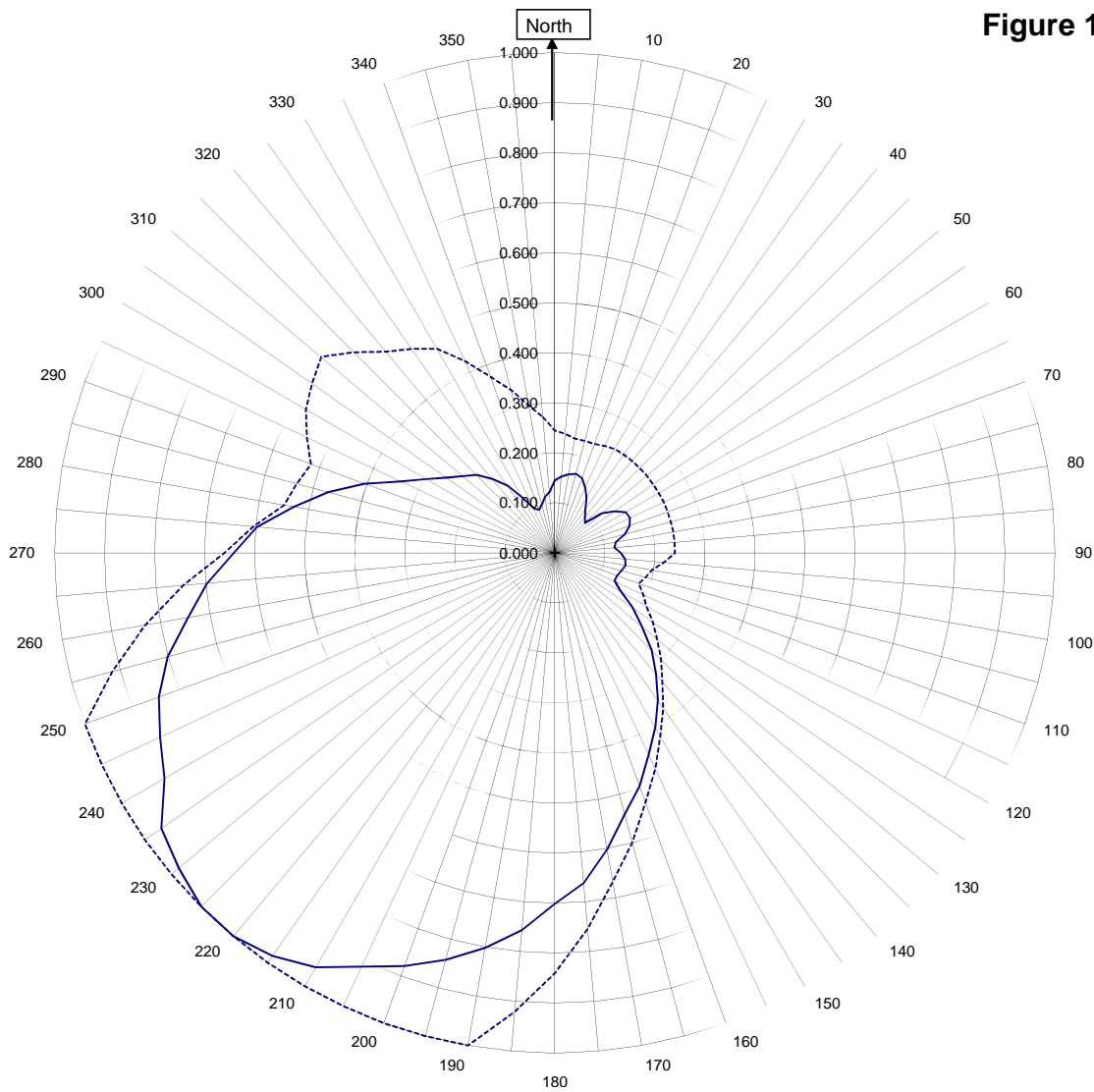
Horizontal RMS	0.423	Frequency	89.1 / 400.95 mHz
Vertical RMS	0.492	Plot	Relative Field
H/V Composite RMS	0.504	Scale	4.5 : 1
FCC Composite RMS	0.592	See Figure 2 for Mechanical Details	

Antenna Model	6025-1-Slant(38°)-DA
Pattern Type	Directional Azimuth

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Figure 1B



## KNSJ DESCANSO, CA.

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—————H/VComposite RMS	0.504
.....FCC Composite RMS	0.592

Frequency	89.1 / 400.95 mHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	6025-1-Slant(38°)-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern  
KNSJ DESCANSO, CA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.145	180	0.463
10	0.160	190	0.645
20	0.159	200	0.841
30	0.126	210	0.956
40	0.094	220	1.000
45	0.085	225	1.000
50	0.124	230	0.982
60	0.164	240	0.901
70	0.159	250	0.756
80	0.124	260	0.564
90	0.107	270	0.370
100	0.107	280	0.223
110	0.097	290	0.131
120	0.078	300	0.060
130	0.052	310	0.015
135	0.035	315	0.033
140	0.016	320	0.052
150	0.054	330	0.056
160	0.153	340	0.018
170	0.288	350	0.053

Figure 1D

Tabulation of Vertical Azimuth Pattern  
KNSJ DESCANSO, CA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.124	180	0.701
10	0.094	190	0.801
20	0.054	200	0.879
30	0.024	210	0.926
40	0.036	220	0.939
45	0.040	225	0.935
50	0.040	230	0.929
60	0.036	240	0.899
70	0.056	250	0.843
80	0.094	260	0.744
90	0.132	270	0.642
100	0.143	280	0.530
110	0.132	290	0.404
120	0.151	300	0.296
130	0.226	310	0.239
135	0.274	315	0.221
140	0.314	320	0.192
150	0.401	330	0.126
160	0.496	340	0.092
170	0.601	350	0.114

Figure 1E

Tabulation of Composite Azimuth Pattern  
KNSJ DESCANSO, CA.

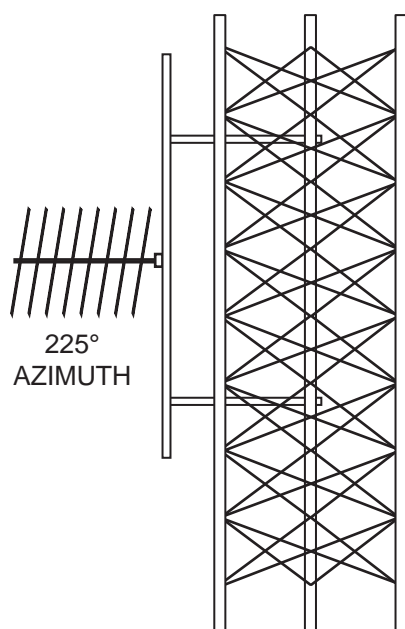
Azimuth	Rel Field	Azimuth	Rel Field
0	0.145	180	0.701
10	0.160	190	0.801
20	0.159	200	0.879
30	0.126	210	0.956
40	0.094	220	1.000
45	0.085	225	1.000
50	0.124	230	0.982
60	0.164	240	0.901
70	0.159	250	0.843
80	0.124	260	0.744
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160	0.496	340	0.092
170	0.601	350	0.114



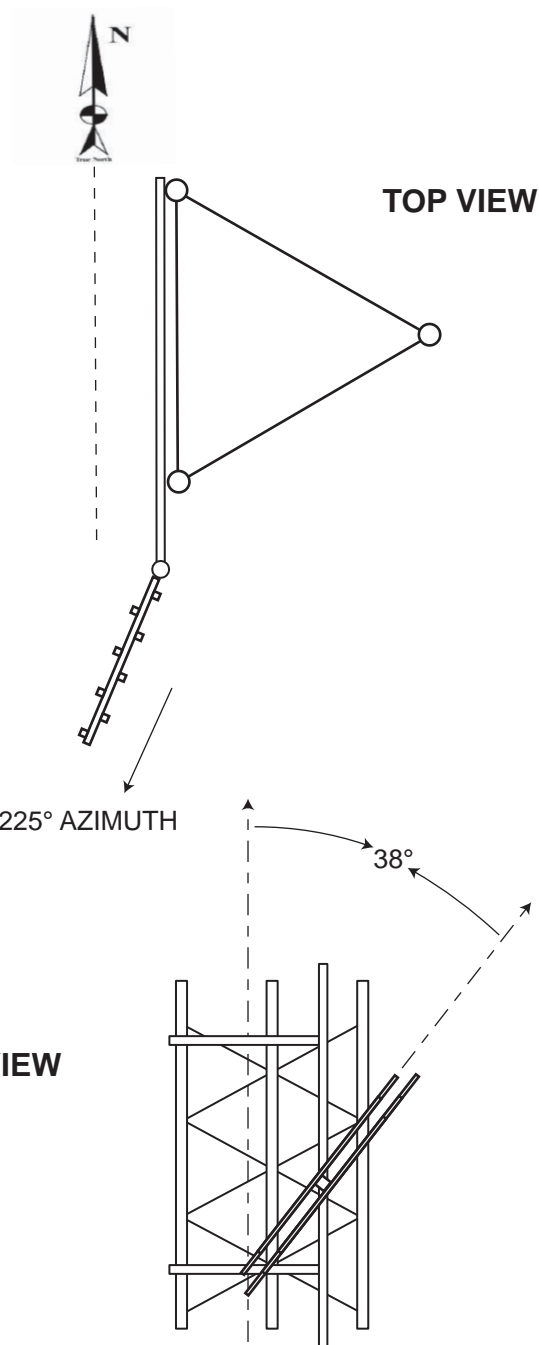
Figure 1F

Tabulation of FCC Directional Composite  
KNSJ DESCANSO, CA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.245	180	0.840
10	0.232	190	1.000
20	0.232	200	1.000
30	0.240	210	1.000
40	0.240	220	1.000
50	0.240	230	1.000
60	0.240	240	1.000
70	0.240	250	1.000
80	0.240	260	0.832
90	0.240	270	0.661
100	0.197	280	0.550
110	0.178	290	0.519
120	0.211	300	0.575
130	0.266	310	0.610
140	0.334	320	0.525
150	0.421	330	0.471
160	0.530	340	0.374
170	0.667	350	0.299



**ELEVATION VIEW**



**PARTIAL FRONT VIEW**

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## SHIVELY LABS

DIV. HOWELL LABS

BRIDGTON, MAINE USA

**FIGURE 2, KNSJ, 89.1 MHz  
MODEL 6025, SLANT (38°)**

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
<b>A</b>	<b>26750</b>	<b>AGF130131-001</b>	—
SCALE	NONE	S/O 30468	SHEET 1 OF 1

Antenna Mfg.: Shively Labs  
Antenna Type: 6025-1-Slant(38°)-DA

Date: 1/31/2013

Station: KNSJ

Beam Tilt 0

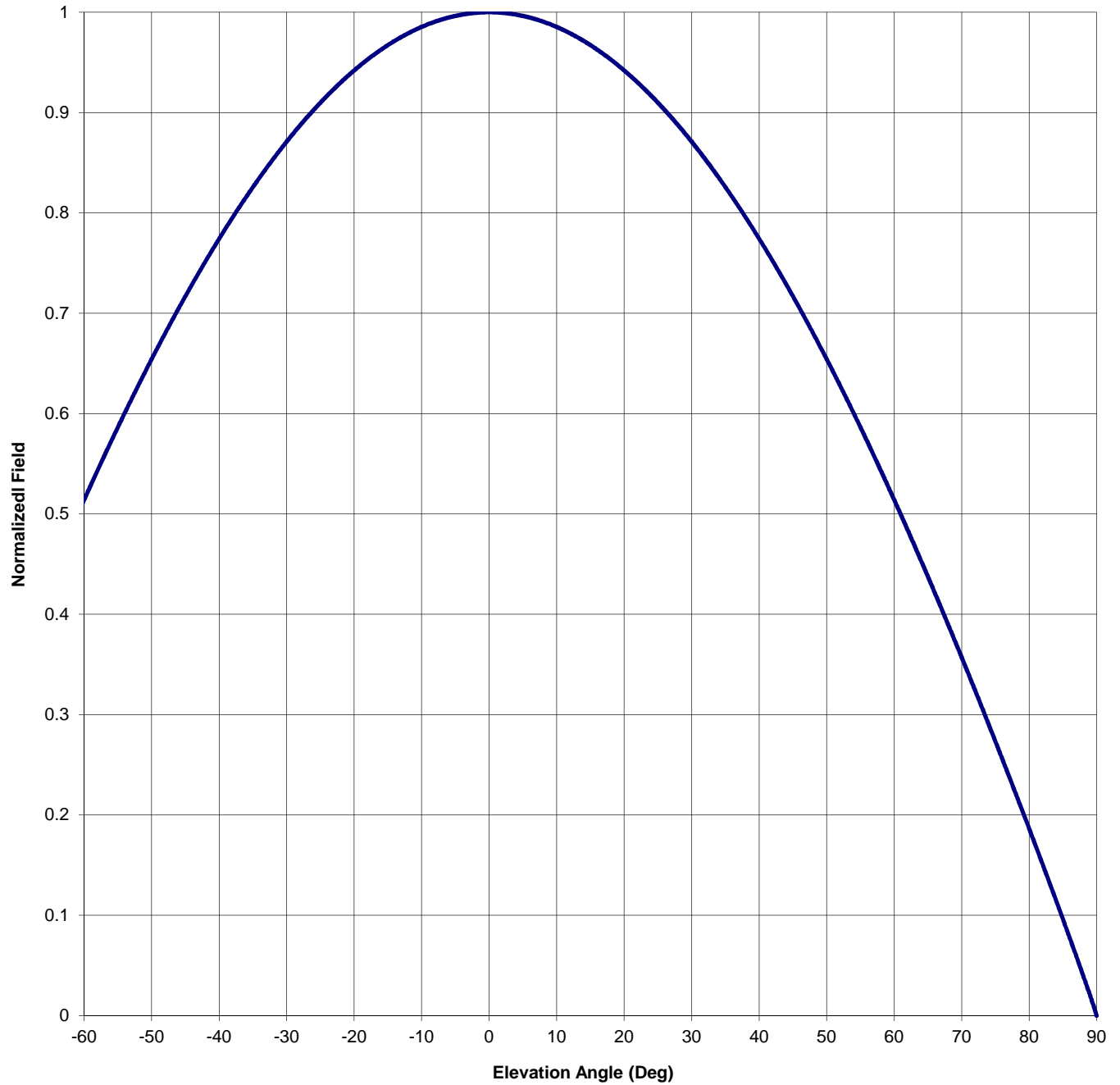
Frequency: 89.1

Gain (Max) 2.443 3.879 dB

Channel #: 206

Gain (Horizon) 2.443 3.879 dB

Figure: Figure 3



Antenna Mfg.: Shively Labs  
 Antenna Type: 6025-1-Slant(38°)-DA

Date: 1/31/2013

Station: KNSJ

Beam Tilt 0

Frequency: 89.1

Gain (Max) 2.443

3.879 dB

Channel #: 206

Gain (Horizon) 2.443

3.879 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	0.729	0	1.000	46	0.705
-89	0.021	-43	0.741	1	1.000	47	0.693
-88	0.040	-42	0.752	2	0.999	48	0.680
-87	0.059	-41	0.763	3	0.999	49	0.667
-86	0.078	-40	0.774	4	0.998	50	0.654
-85	0.096	-39	0.785	5	0.996	51	0.641
-84	0.114	-38	0.796	6	0.995	52	0.628
-83	0.133	-37	0.806	7	0.993	53	0.614
-82	0.151	-36	0.816	8	0.991	54	0.600
-81	0.168	-35	0.826	9	0.988	55	0.586
-80	0.186	-34	0.835	10	0.985	56	0.572
-79	0.204	-33	0.845	11	0.982	57	0.558
-78	0.221	-32	0.854	12	0.979	58	0.544
-77	0.239	-31	0.862	13	0.975	59	0.529
-76	0.256	-30	0.871	14	0.971	60	0.514
-75	0.273	-29	0.879	15	0.967	61	0.499
-74	0.290	-28	0.887	16	0.963	62	0.484
-73	0.307	-27	0.895	17	0.958	63	0.469
-72	0.324	-26	0.903	18	0.953	64	0.453
-71	0.341	-25	0.910	19	0.948	65	0.437
-70	0.357	-24	0.917	20	0.942	66	0.422
-69	0.373	-23	0.924	21	0.936	67	0.406
-68	0.390	-22	0.930	22	0.930	68	0.390
-67	0.406	-21	0.936	23	0.924	69	0.373
-66	0.422	-20	0.942	24	0.917	70	0.357
-65	0.437	-19	0.948	25	0.910	71	0.341
-64	0.453	-18	0.953	26	0.903	72	0.324
-63	0.469	-17	0.958	27	0.895	73	0.307
-62	0.484	-16	0.963	28	0.887	74	0.290
-61	0.499	-15	0.967	29	0.879	75	0.273
-60	0.514	-14	0.971	30	0.871	76	0.256
-59	0.529	-13	0.975	31	0.862	77	0.239
-58	0.544	-12	0.979	32	0.854	78	0.221
-57	0.558	-11	0.982	33	0.845	79	0.204
-56	0.572	-10	0.985	34	0.835	80	0.186
-55	0.586	-9	0.988	35	0.826	81	0.168
-54	0.600	-8	0.991	36	0.816	82	0.151
-53	0.614	-7	0.993	37	0.806	83	0.133
-52	0.628	-6	0.995	38	0.796	84	0.114
-51	0.641	-5	0.996	39	0.785	85	0.096
-50	0.654	-4	0.998	40	0.774	86	0.078
-49	0.667	-3	0.999	41	0.763	87	0.059
-48	0.680	-2	0.999	42	0.752	88	0.040
-47	0.693	-1	1.000	43	0.741	89	0.021
-46	0.705	0	1.000	44	0.729	90	0.000
-45	0.717			45	0.717		

## VALIDATION OF TOTAL POWER GAIN CALCULATION

KNSJ DESCANSO, CA.

MODEL 6025-1-DA

Elevation Gain of Antenna 0.508

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

H RMS 0.422828 V RMS 0.491855 H/V Ratio 0.860

Elevation Gain of Horizontal Component 0.437

Elevation Gain of Vertical Component 0.591

Horizontal Azimuth Gain equals  $1/(\text{RMS})^2$ . 5.593Vertical Azimuth Gain equals  $1/(\text{RMS}/\text{Max Vert})^2$ . 3.645

Max. Vertical 0.939

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

Total Horizontal Power Gain = 2.443

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

Total Vertical Power Gain = 2.154

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.33 kW ERP Divided by H Gain 2.443 equals 0.135 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.135 kW Times V Gain 2.154 equals 0.291 kW V ERP

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

(0.939)<sup>2</sup> Times 0.33 Equals 0.291 kW Vertical ERP

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