Shively Labs
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S.O. 26104

Report of Test 6810-6D-DA

for

TEAM RADIO, L.L.C.

KPNC 100.7 MHz Ponca City, OK

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-6D-DA to meet the needs of KPNC and to comply with the requirements of the FCC construction permit, file number BPH-20070718AAE.

RESULTS:

The measured azimuth pattern for the 6810-6D-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. Figure 1C shows the Tabulation of the FCC Composite Pattern. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPH-20070718AAE indicates that the Horizontal radiation component shall not exceed 25.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

200 Degrees T: 12.5 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 065 Degrees T to 080 Degrees T and at 274 Degrees T to 281 Degrees T. At the restricted azimuth of 200 Degrees T the Horizontal component is 3.6 dB down from the maximum of 25.0 kW, or 10.9 kW.

The R.M.S. of the Horizontal component is 0.785. The total Horizontal power gain is 5.716. The R.M.S. of the Vertical component is 0.731. The total Vertical power gain is 5.602. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.969. The R.M.S. of the measured composite pattern is 0.825. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.824. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-6D-DA was mounted on a tower of precise scale to the World-24 tower at the KPNC site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1. A horizontal parasitic element was placed directly under the bay. The position of this horizontal parasitic element was changed until the horizontal pattern shown in Figure 1 was achieved. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BPH-20070718AAE, a single level of the 6810-6D-DA was set up on the Howell Laboratories 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 9th and 10th 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

The test equipment is calibrated to ANSI/NCSL Z540-1-1994.

TEST PROCEDURES:

The corner reflector is mounted so that the horizontal and vertical azimuth patterns are measured independently by rotating the corner reflector by 90 degrees. The network analyzer was set to 453.15 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 1.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 26104
November 20, 2007

Shively Labs

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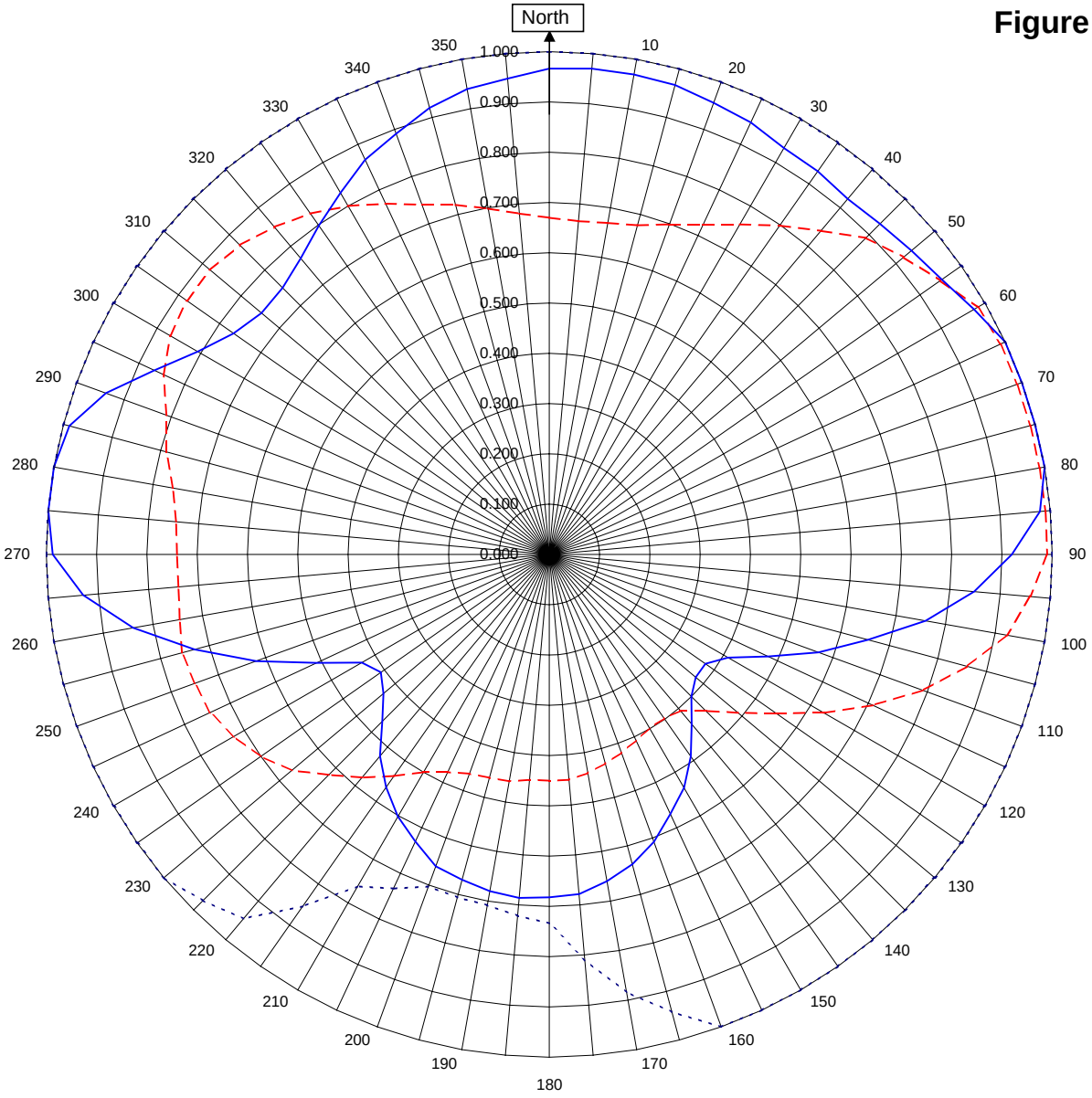
Figure 1



KPNC Ponca City, OK

26104

November 20, 2007

Horizontal RMS	0.785
Vertical RMS	0.731
H/V Composite RMS	0.825
FCC Composite RMS	0.969

Frequency	100.7 / 453.15 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-6D-DA Pattern 25-BB
Pattern Type	Directional Azimuth

Figure 1a

Tabulation of Horizontal Azimuth Pattern
KPNC Ponca City, OK

Azimuth	Rel Field	Azimuth	Rel Field
0	0.966	180	0.682
10	0.969	190	0.680
20	0.956	200	0.660
30	0.933	210	0.602
40	0.923	220	0.523
45	0.930	225	0.470
50	0.940	230	0.430
60	0.975	240	0.430
70	1.000	250	0.620
80	1.000	260	0.840
90	0.920	270	0.987
100	0.760	280	1.000
110	0.570	290	0.938
120	0.410	300	0.807
130	0.380	310	0.747
135	0.400	315	0.750
140	0.440	320	0.769
150	0.536	330	0.830
160	0.608	340	0.890
170	0.660	350	0.940

Figure 1b

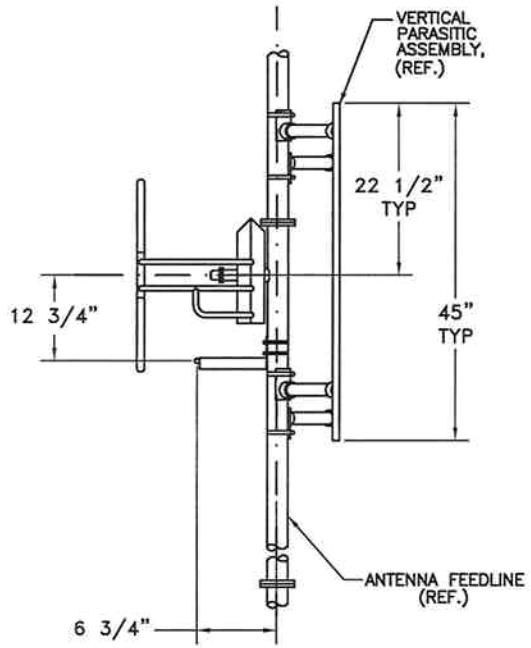
Tabulation of Vertical Azimuth Pattern
KPNC Ponca City, OK

Azimuth	Rel Field	Azimuth	Rel Field
0	0.670	180	0.450
10	0.670	190	0.458
20	0.698	200	0.464
30	0.758	210	0.500
40	0.840	220	0.579
45	0.890	225	0.620
50	0.920	230	0.668
60	0.984	240	0.724
70	0.990	250	0.750
80	0.990	260	0.746
90	0.990	270	0.740
100	0.923	280	0.760
110	0.790	290	0.810
120	0.630	300	0.870
130	0.490	310	0.880
135	0.440	315	0.870
140	0.406	320	0.850
150	0.399	330	0.800
160	0.420	340	0.740
170	0.442	350	0.698

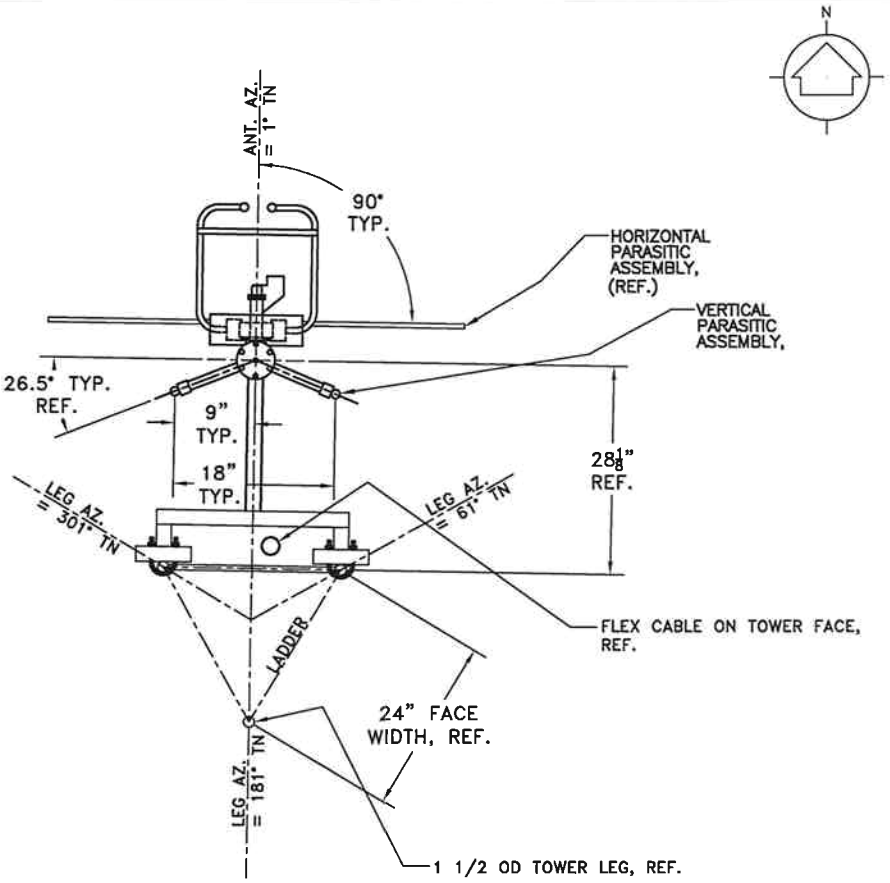
Figure 1c

Tabulation of FCC Directional Composite
KPNC Ponca City, OK

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.734
10	1.000	190	0.709
20	1.000	200	0.703
30	1.000	210	0.763
40	1.000	220	0.946
50	1.000	230	1.000
60	1.000	240	1.000
70	1.000	250	1.000
80	1.000	260	1.000
90	1.000	270	1.000
100	1.000	280	1.000
110	1.000	290	1.000
120	1.000	300	1.000
130	1.000	310	1.000
140	1.000	320	1.000
150	1.000	330	1.000
160	1.000	340	1.000
170	0.884	350	1.000



SIDE VIEW



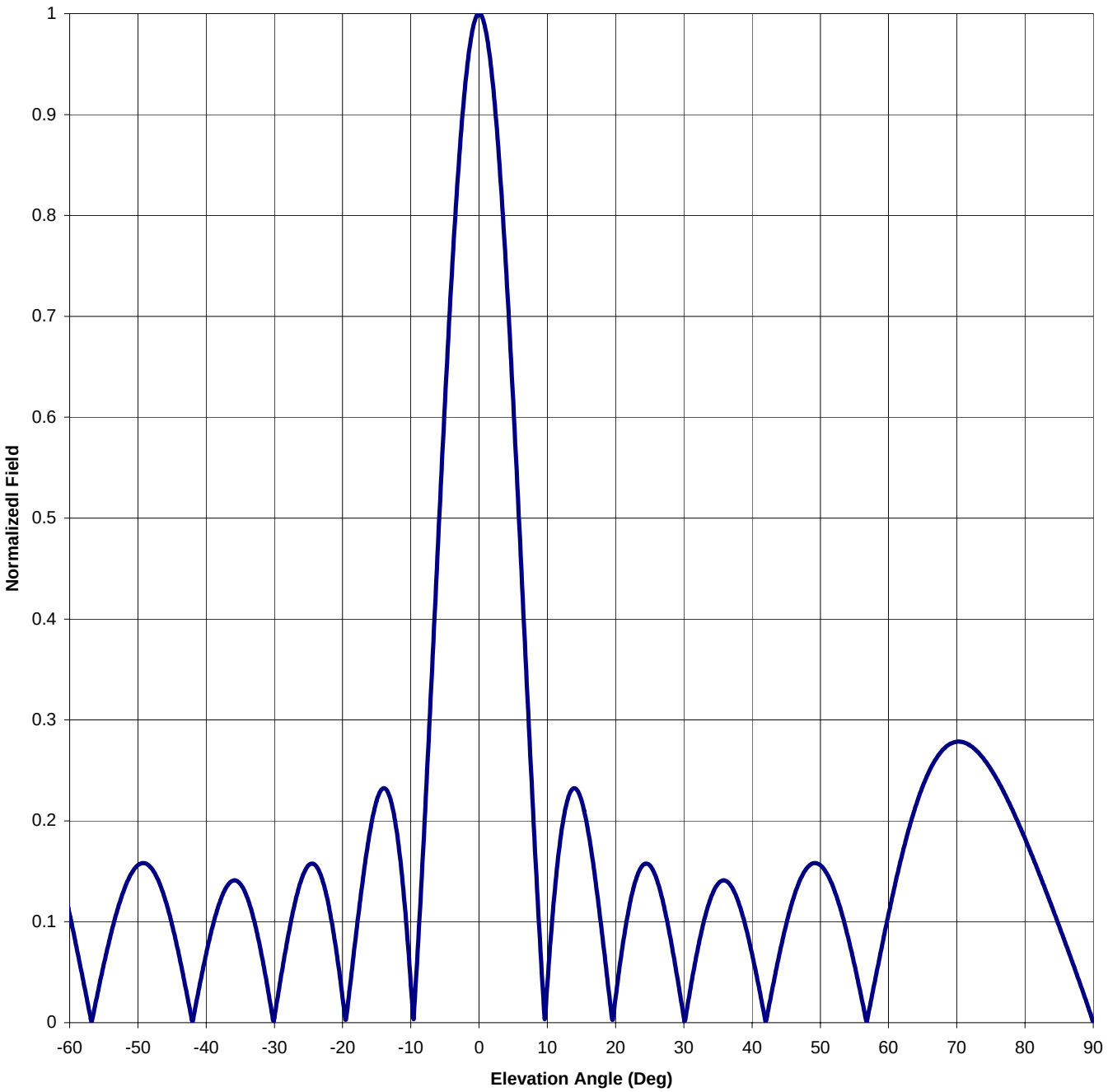
TOP VIEW

TOWER MAKE: WORLD 24

ANTENNA HEADING 1° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 26104	FREQUENCY: 100.7	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY:
TITLE: MODEL-6810-6D-DIRECTIONAL ANTENNA			
DATE: 11/15/07	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date: 11/20/2007**
Antenna Type:	**6810-6D-DA**			
Station:	**KPNC**	**Beam Tilt**	**0**	
Frequency:	**100.7**	**Gain (Max)**	**5.716**	**7.571 dB**
Channel #:	**264**	**Gain (Horizon)**	**5.716**	**7.571 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs
Antenna Type: 6810-6D-DA
Station: KPNC
Frequency: 100.7
Channel #: 264
Figure: 3

Beam Tilt 0
Gain (Max) 5.716
Gain (Horizon) 5.716

Date: 11/20/2007
7.571 dB
7.571 dB

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	0.068	0	1.000	46	0.122
-89	0.021	-43	0.035	1	0.983	47	0.141
-88	0.040	-42	0.000	2	0.931	48	0.153
-87	0.059	-41	0.035	3	0.849	49	0.158
-86	0.077	-40	0.068	4	0.742	50	0.156
-85	0.096	-39	0.097	5	0.615	51	0.147
-84	0.114	-38	0.120	6	0.477	52	0.132
-83	0.132	-37	0.135	7	0.335	53	0.112
-82	0.149	-36	0.141	8	0.197	54	0.086
-81	0.166	-35	0.138	9	0.071	55	0.058
-80	0.182	-34	0.124	10	0.038	56	0.026
-79	0.198	-33	0.102	11	0.124	57	0.007
-78	0.213	-32	0.072	12	0.186	58	0.041
-77	0.227	-31	0.035	13	0.222	59	0.075
-76	0.240	-30	0.005	14	0.232	60	0.107
-75	0.251	-29	0.046	15	0.220	61	0.138
-74	0.261	-28	0.085	16	0.189	62	0.167
-73	0.269	-27	0.118	17	0.144	63	0.192
-72	0.275	-26	0.143	18	0.089	64	0.215
-71	0.278	-25	0.156	19	0.031	65	0.234
-70	0.278	-24	0.156	20	0.025	66	0.250
-69	0.276	-23	0.142	21	0.075	67	0.262
-68	0.271	-22	0.115	22	0.115	68	0.271
-67	0.262	-21	0.075	23	0.142	69	0.276
-66	0.250	-20	0.025	24	0.156	70	0.278
-65	0.234	-19	0.031	25	0.156	71	0.278
-64	0.215	-18	0.089	26	0.143	72	0.275
-63	0.192	-17	0.144	27	0.118	73	0.269
-62	0.167	-16	0.189	28	0.085	74	0.261
-61	0.138	-15	0.220	29	0.046	75	0.251
-60	0.107	-14	0.232	30	0.005	76	0.240
-59	0.075	-13	0.222	31	0.035	77	0.227
-58	0.041	-12	0.186	32	0.072	78	0.213
-57	0.007	-11	0.124	33	0.102	79	0.198
-56	0.026	-10	0.038	34	0.124	80	0.182
-55	0.058	-9	0.071	35	0.138	81	0.166
-54	0.086	-8	0.197	36	0.141	82	0.149
-53	0.112	-7	0.335	37	0.135	83	0.132
-52	0.132	-6	0.477	38	0.120	84	0.114
-51	0.147	-5	0.615	39	0.097	85	0.096
-50	0.156	-4	0.742	40	0.068	86	0.077
-49	0.158	-3	0.849	41	0.035	87	0.059
-48	0.153	-2	0.931	42	0.000	88	0.040
-47	0.141	-1	0.983	43	0.035	89	0.021
-46	0.122	0	1.000	44	0.068	90	0.000
-45	0.097			45	0.097		

S.O. 26104 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KPNC 100.7 MHz PONCA CITY, OK

MODEL 6810-6D-DA

Elevation Gain of Antenna 3.28

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

H RMS 0.785 V RMS 0.731 H/V Ratio 1.074

Elevation Gain of Horizontal Component 3.522

Elevation Gain of Vertical Component 3.054

Horizontal Azimuth Gain equals 1/(RMS)SQ. 1.623

Vertical Azimuth Gain equals 1/(RMS/Max Vert)SQ. 1.834
Max. Vertical 0.99

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

Total Horizontal Power Gain = **5.716**

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

Total Vertical Power Gain = **5.602**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

25 KW ERP Equals 4.374 KW Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

4.374 KW Times 5.602 KW Equals 24.503 KW ERP

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

0.99 Equals 24.503 KW Vertical ERP

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