Shively Labs
a division of Howell Laboratories, Inc.
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P. O. Box 389 Harrison Rd.,
Bridgton, Maine 04009 USA
(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 22506

Report of Test 6810-2R-DA

for

Mountaintop Broadcasting

KLFC 88.1 MHz Branson, MO

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-DA to meet the needs of KLFC and to comply with the requirements of the FCC construction permit, file number BPED-20000324ABH.

RESULTS:

The measured azimuth pattern for the 6810-2R-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPED-20000324ABH indicates that the Horizontal radiation component shall not exceed 1.8 kW at any azimuth and is restricted to the following values at the azimuths specified:

0-50 Degrees T: 320 watts

330-360 Degrees T: 320 watts

From Figure 1, the maximum radiation of the Horizontal component occurs at 137 Degrees T to 150 Degrees T and at 195 Degrees T to 262 Degrees T. At the restricted azimuth of 0-50 Degrees T the Horizontal component is 7.959 dB down from the maximum of 1.8 kW, or 288 W. At the restricted azimuth of 330-360 Degrees T, the Horizontal component is 7.744 dB down from the maximum of 1.8 kW, or 303 W.

The R.M.S. of the Horizontal component is 0.795. The total Horizontal power gain is 1.628. The R.M.S. of the Vertical component is 0.765. The total Vertical power gain is 1.596. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.840. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2R-DA was mounted on a tower of exact scale to a Rohn 24" tower. The spacing of the antenna to the tower was varied and vertical parasitic elements were attached to the interbay feedline 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 BPED-20000324ABH, a single level of the 6810-2R-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 Edition 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.

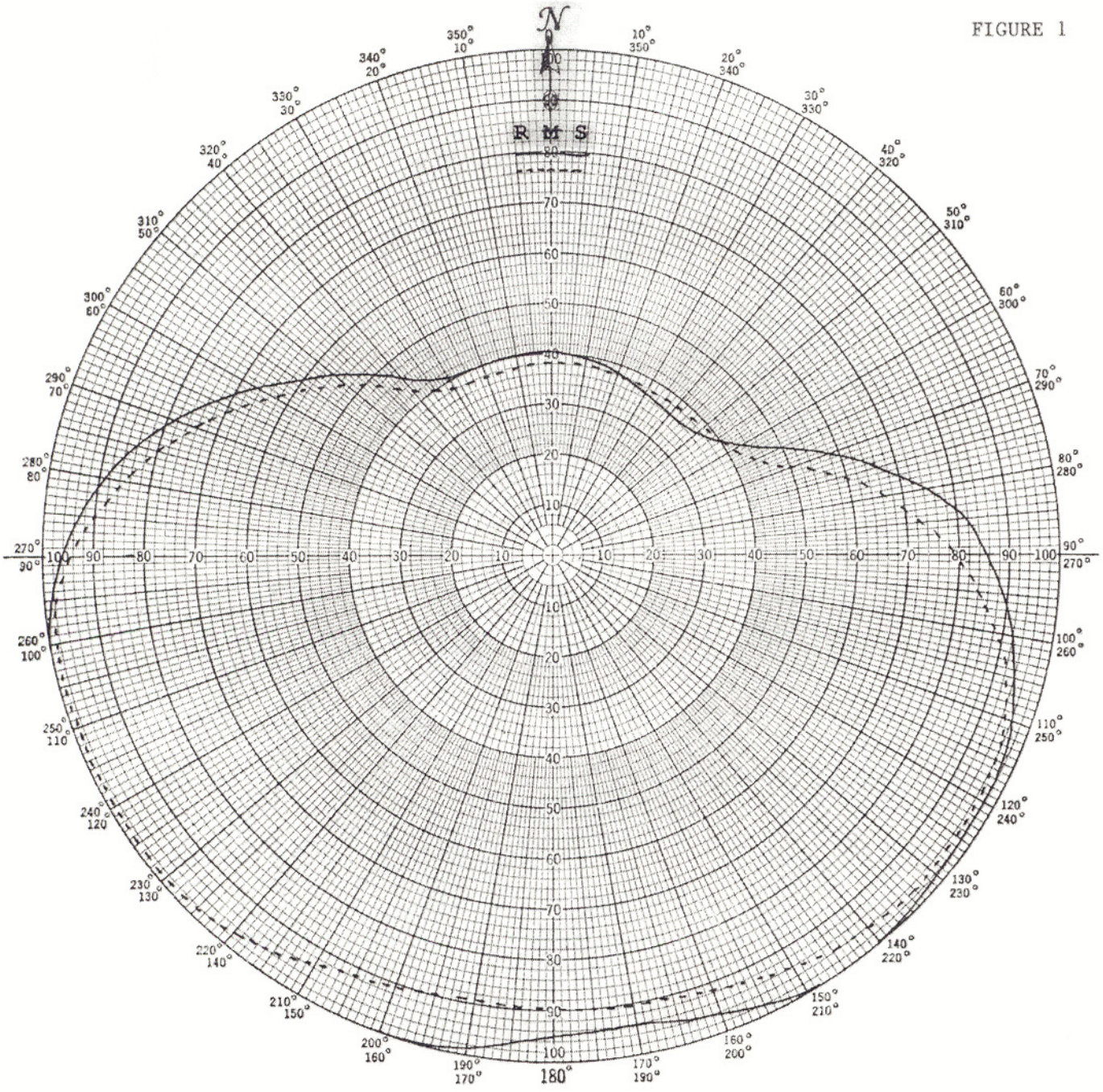
TEST PROCEDURES:

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 396.45 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
Manager of RF Engineering
S/O 22506
May 13, 2002

FIGURE 1



Shively Labs

PROJECT NAME KLFC BRANSON, MO

PROJECT NUMBER 22506 DATE 5/6/02

MODEL (X) FULL SCALE ( ) FREQUENCY 396.45/88.1 MHz

POLARIZATION HORIZ (———); VERT (----)

CURVE PLOTTED IN: VOLTAGE (X) POWER( ) DB( )

OBSERVER RAS

ANTENNA TYPE 6810-2R-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

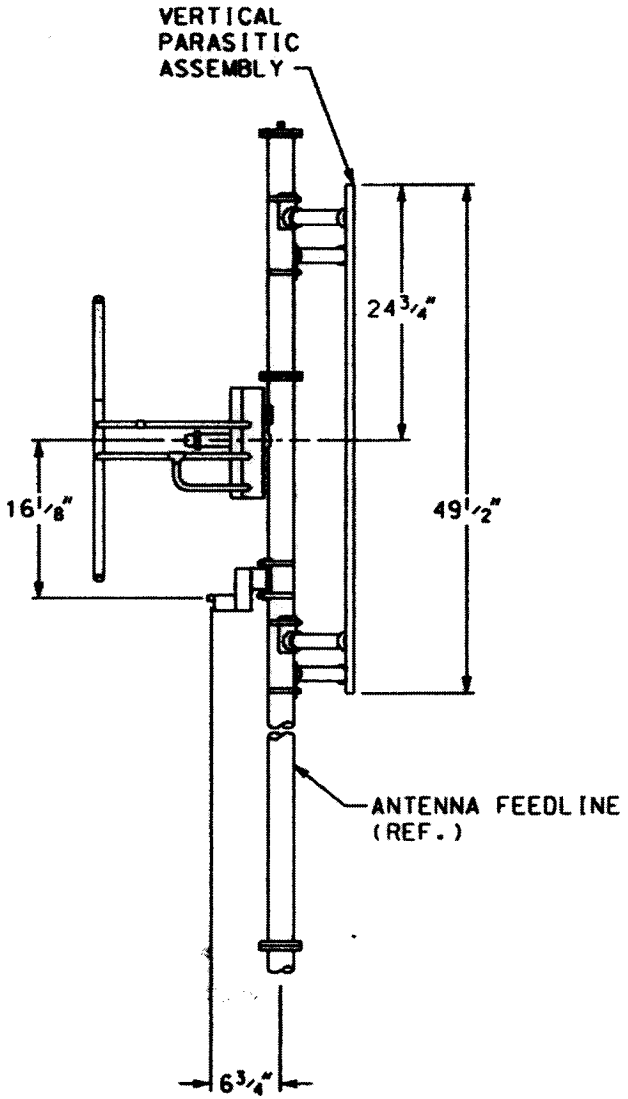
S/O 22506
TABULATION OF HORIZONTAL POLARIZATION
KLFC BRANSON, MO

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.400	180	0.950
10	0.395	190	0.985
20	0.385	200	1.000
30	0.370	210	1.000
40	0.365	220	1.000
45	0.365	225	1.000
50	0.370	230	1.000
60	0.430	240	1.000
70	0.580	250	1.000
80	0.750	260	1.000
90	0.855	270	0.960
100	0.920	280	0.890
110	0.960	290	0.790
120	0.980	300	0.670
130	0.985	310	0.560
135	0.990	315	0.510
140	1.000	320	0.460
150	1.000	330	0.410
160	0.965	340	0.400
170	0.940	350	0.400

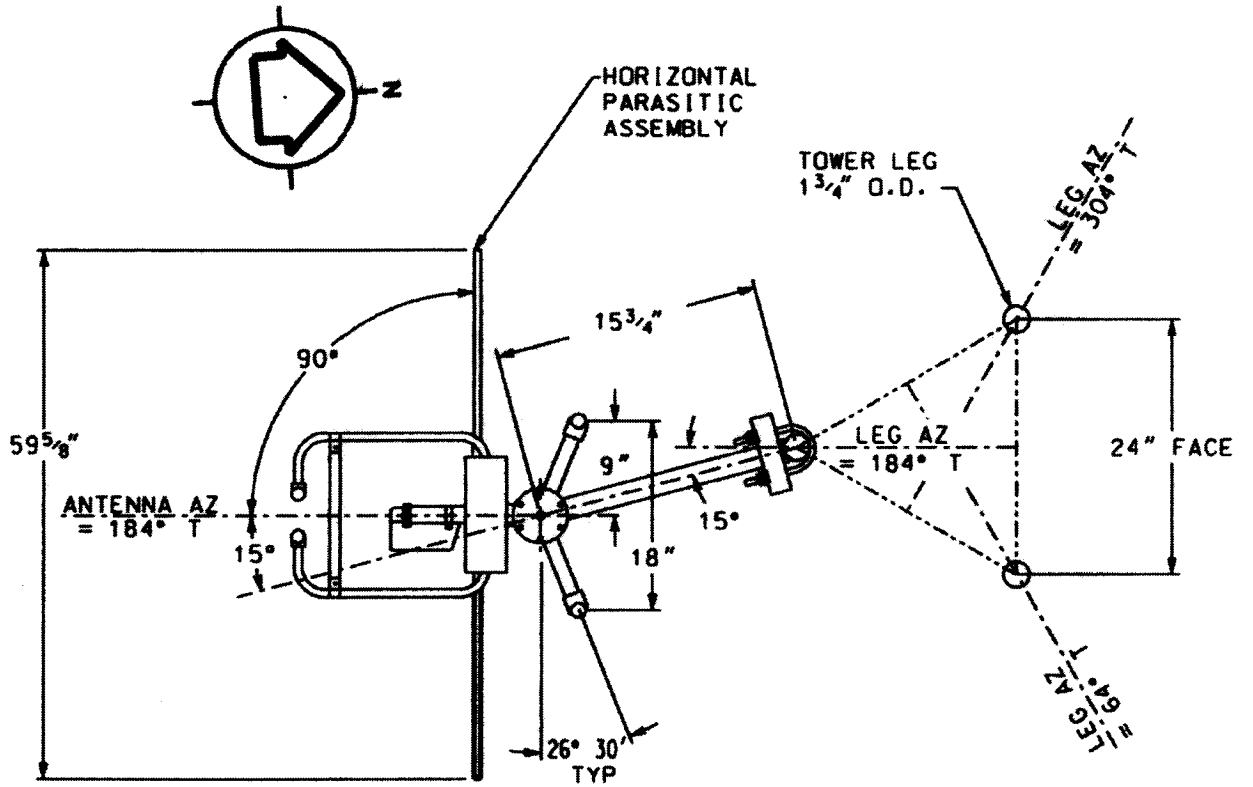
Figure 1B

S/O 22506
TABULATION OF VERTICAL POLARIZATION
KLFC BRANSON, MO

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.380	180	0.900
10	0.380	190	0.895
20	0.380	200	0.905
30	0.380	210	0.930
40	0.380	220	0.970
45	0.385	225	0.980
50	0.390	230	0.990
60	0.410	240	0.990
70	0.500	250	0.990
80	0.665	260	0.990
90	0.790	270	0.950
100	0.890	280	0.850
110	0.945	290	0.740
120	0.965	300	0.630
130	0.970	310	0.530
135	0.970	315	0.470
140	0.960	320	0.425
150	0.940	330	0.380
160	0.915	340	0.380
170	0.900	350	0.380



SIDE VIEW



TOP VIEW

TOWER: 24" FACE

SHIVELY LABS			
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE USA			
SHOP ORDER: 22506	FREQUENCY: 88.1 MHz	SCALE: N.T.S.	DRAWN BY: NMS APPROVED BY:
MODEL: MODEL-6810-2R-DIRECTIONAL ANTENNA			
DATE: 5-9-02	FIGURE 2		

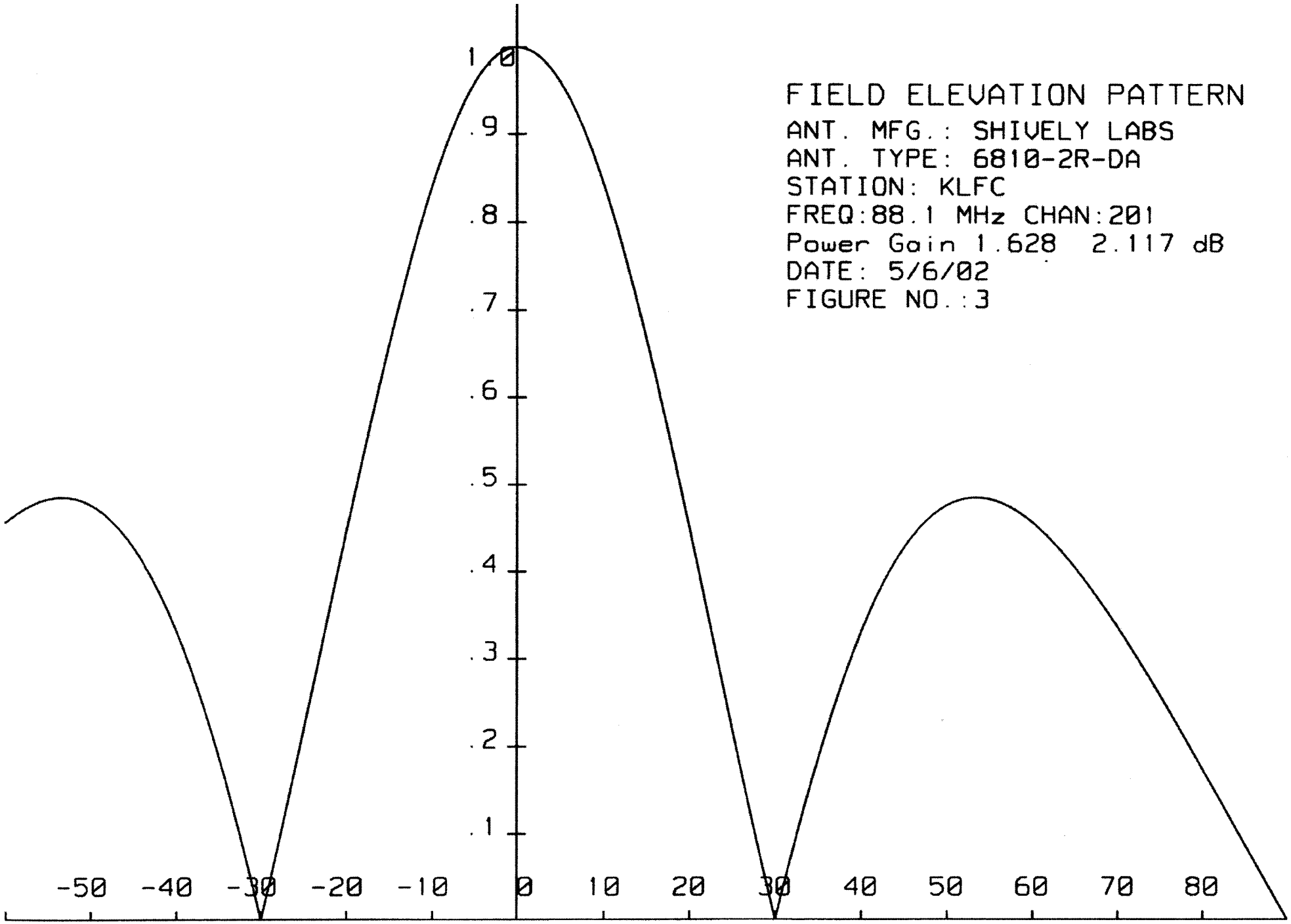

1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-2R-DA
STATION: KLFC
FREQ:88.1 MHz CHAN:201
Power Gain 1.628 2.117 dB
DATE: 5/6/02
FIGURE NO.:3

FIGURE 4

S.O. 22506

VALIDATION OF GAIN CALCULATION

KLFC BRANSON, MO

MODEL 6810-2R-DA

Elevation Gain of 6810-2R-DA equals 0.990

The RMS values are calculated utilizing the data of a planimeter.

Horizontal RMS divided by Vertical RMS equals
$0.795 \div 0.765 = 1.0392$

Elevation Gain of Horizontal Component equals
$0.990 \times 1.0392 = 1.029$

Elevation Gain of Vertical Component equals
$0.990 \times 0.962 = 0.953$

Horizontal Azimuth Gain equals $1/(RMS)^2$
$1/(0.795)^2 = 1.582$

Vertical Azimuth Gain equals $1/(RMS + Max\ Vert)^2$
$1/(0.765 \div 0.990)^2 = 1.675$

* **Total Horizontal Gain is Elevation Gain times Azimuth Gain**
  $1.029 \times 1.582 = 1.628$

* **Total Vertical Gain is Elevation Gain times Azimuth Gain**
  $0.953 \times 1.675 = 1.596$

ERP divided by Horizontal Gain equals Antenna Input Power
$1.80\ kW \div 1.628 = 1.106\ kW$

Antenna Input Power times Vertical Gain equals Vertical ERP
$1.106\ kW \times 1.596 = 1.765\ kW$

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.990)^2 \times 1.80\ kW = 1.764\ kW$

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

ROZELL SURVEY CO.
Registered Land Surveyors
Diane K. Diebold, RLS
Kenneth J. Buchanan, RLS
2404 State Highway 248 Suite 4 Branson, Missouri 65616
Phone No. 417-334-4141 Facsimile No. 417-334-4181

Monday, August 05, 2002

KLFC Radio
205 W Atlantic
Branson, Missouri, 65616

Attn: Mr. Herb Smith

Re: The orientation of the new antennas on the tower located on Gibson Road, Taney County, Missouri.

Dear Mr. Smith;

Rozell Survey Company was requested on two different occasions to locate the azimuth new antennas on the existing tower. The first location was attempted on July 23, 2002. This attempt was terminated when the equipment failed. The second location was completed on August 1, 2002. Based on the field location at this time the following affidavit is being prepared.

STATE OF MISSOURI)
COUNTY OF STONE)

I, Kenneth J. Buchanan, Missouri Professional Land Surveyor No. LS-2340, upon my oath declares the following:

1. I instructed one of my field crews to locate the position on the new antenna on the tower site on Gibson Road.

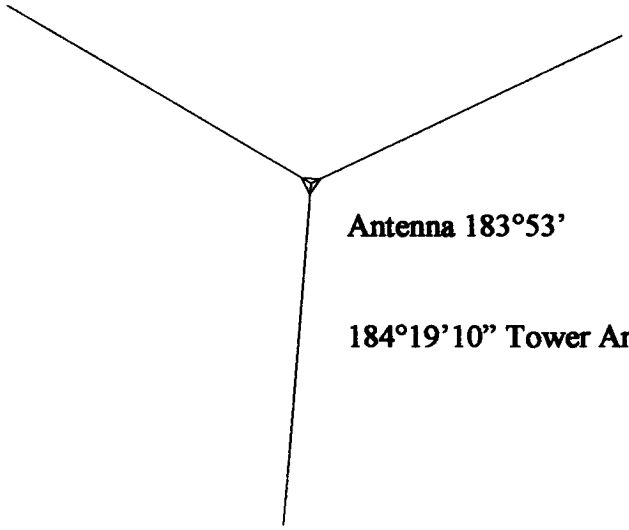
2. I, instructed the crew to locate a visible face on the antenna from two separate positions no closer than ten feet from each other, to determine the antenna azimuth.

3. The field crew observed the installation of the upper portion of the new antenna, and assisted the installers in determining the correct orientation of the upper portion of the antenna.

4. The two locations, determined the final placement of the antenna to be at a **Grid azimuth of 184°20'** and an **Astronomic azimuth of 183°53'**.

5. The lower portion of the new antenna was placed after the Rozell Survey field crew had left the site.

6. Based on visual conformation by Mr. Herb Smith and the Site foreman the two portions of the antenna are in line with one and another.



IN WITNESS HEREOF, I set my hand and seal this 5th day of August, 2002

STATE OF MISSOURI
8-5-02
KENNETH J.
BUCHANAN
NUMBER
LS-2340
REGISTERED LAND SURVEYOR

Kenneth J. Buchanan, LS 2340

SUBSCRIBED AND SWORN before me, a Notary Public, on this 5th day of August, 2002.

KIMBERLY S. HINSLEY
NOTARY SEAL
NOTARY PUBLIC
STATE OF MISSOURI

Printed Name: Kimberly S. Hinsley
Notary Public

My commission expires: 4-12-05

8-02-02

Shawn Baker
PO Box 418
Willard Mo 65781
417-742-5065

I was retained as technical consultant by KLFC radio for upgrades of the transmitter site near Branson, Mo. I have approximately 11 years of radio engineering experience and have certified installation of multiple directional FM stations during that time. I observed the installation of the directional antenna. To the best of my knowledge, the antenna and coax were installed per all manufacturer instructions and in the correct orientation.

Shawn Baker