

## S.O. 30820

### Report of Test 6018-8/3-H-DA

for

Radio Bilingue, Inc.

KRZU 90.7 MHz Batesville, TX

### OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6018-8/3-H-DA to meet the needs of KRZU and to comply with the requirements of the FCC construction permit, file number BMPED-20121024ACV. 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 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 BMPED-20121024ACV indicates that the Horizontal radiation component shall not exceed 100 kW at any azimuth and is restricted to the following values at the azimuths specified:

140 - 150 Degrees True: 25 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 65 Degrees True, 223 Degrees True to 225 Degrees True and 320 Degrees True to 325 Degrees True. At the restricted azimuth of 140- 150 Degrees True the Horizontal component is 13.270 dB down from the maximum of 100 kW, or 4.71 kW.

The R.M.S. of the Horizontal component is 0.826. The total Horizontal power gain is 13.998. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.962 The R.M.S. of the measured composite pattern is 0.826. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.818. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

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

One bay of the 6018-8/3-H-DA was mounted on a tower of precise scale to the tower at the KRZU 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 BMPED-20121024ACV, a single level of the 6018-8/3-H-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 408.15 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 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:

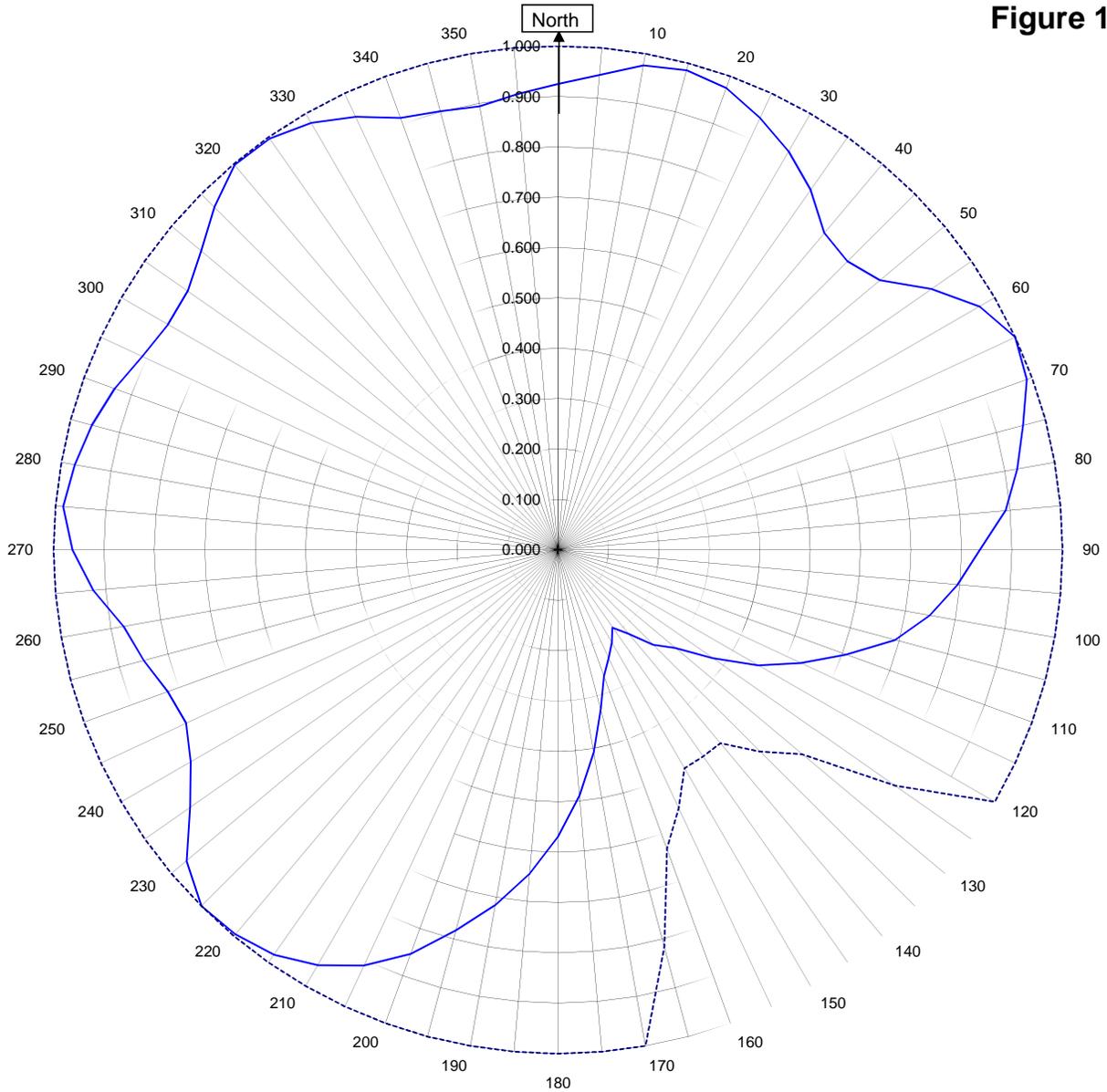


Robert A. Surette  
Director of Sales Engineering  
S/O 30820  
July 9, 2013

# Shively Labs

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

Figure 1A



**KRZU**

**BATESVILLE, TX**

30820  
July 8, 2013

— Horizontal RMS	0.826
- - - Vertical RMS	0.000
H/V Composite RMS	0.826
..... FCC Composite RMS	0.962

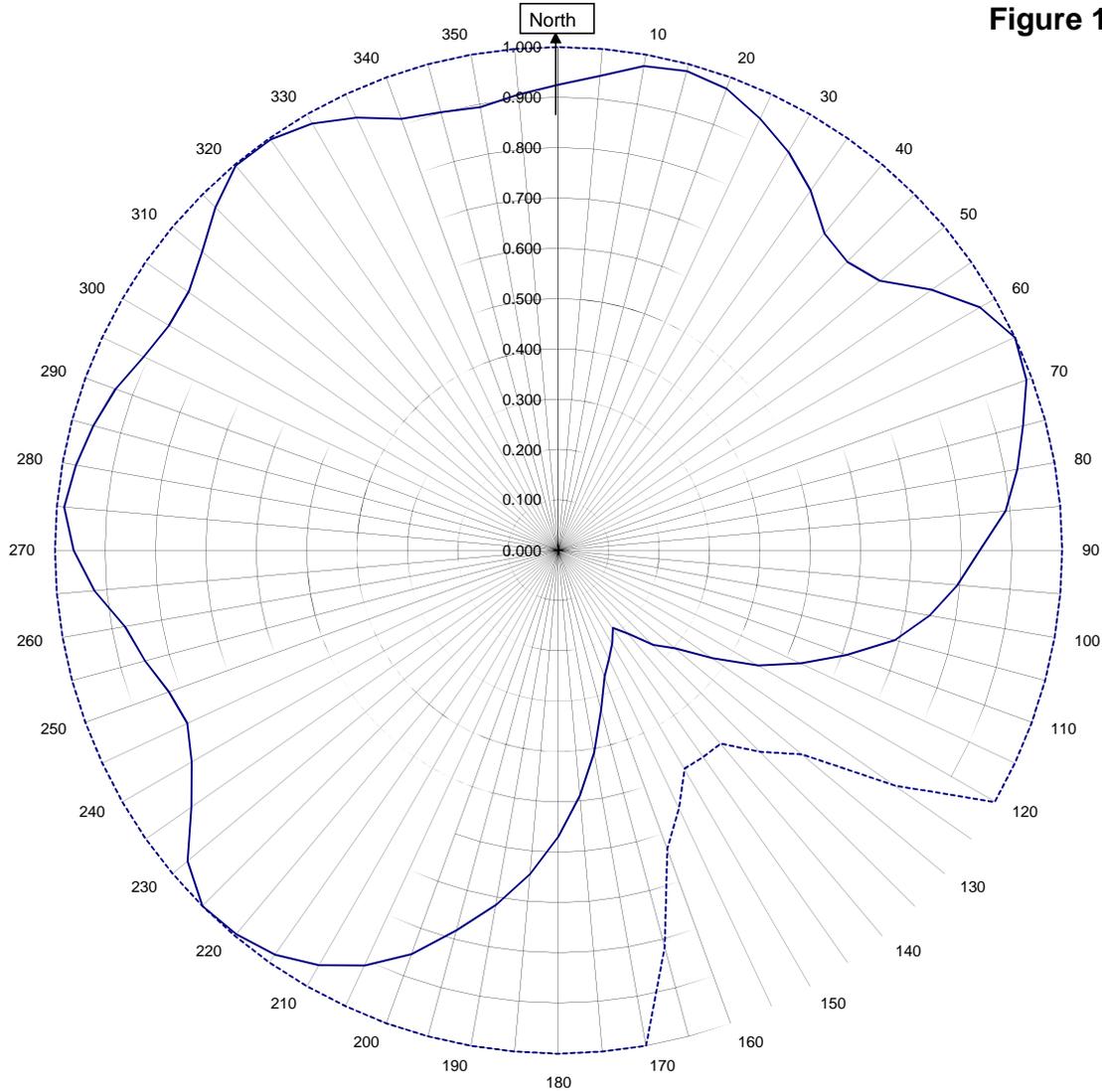
Frequency	90.7 / 408.15 MHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6018-8/3/-H-DA
Pattern Type	Directional Azimuth

# Shively Labs

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**Figure 1B**



## KRZU BATESVILLE, TX

30820  
July 8, 2013

———H/V Composite RMS	0.826
.....FCC Composite RMS	0.962

Frequency	90.7 / 408.15 mHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	6018-8/3/-H-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern  
KRZU BATESVILLE, TX

Azimuth	Rel Field	Azimuth	Rel Field
0	0.925	180	0.569
10	0.977	190	0.716
20	0.976	200	0.854
30	0.913	210	0.952
40	0.821	220	0.995
45	0.811	225	1.000
50	0.833	230	0.961
60	0.966	240	0.841
70	0.989	250	0.823
80	0.925	260	0.874
90	0.837	270	0.963
100	0.748	280	0.973
110	0.608	290	0.936
120	0.458	300	0.893
130	0.303	310	0.923
135	0.266	315	0.963
140	0.217	320	0.998
150	0.213	330	0.979
160	0.267	340	0.912
170	0.408	350	0.894

Figure 1E

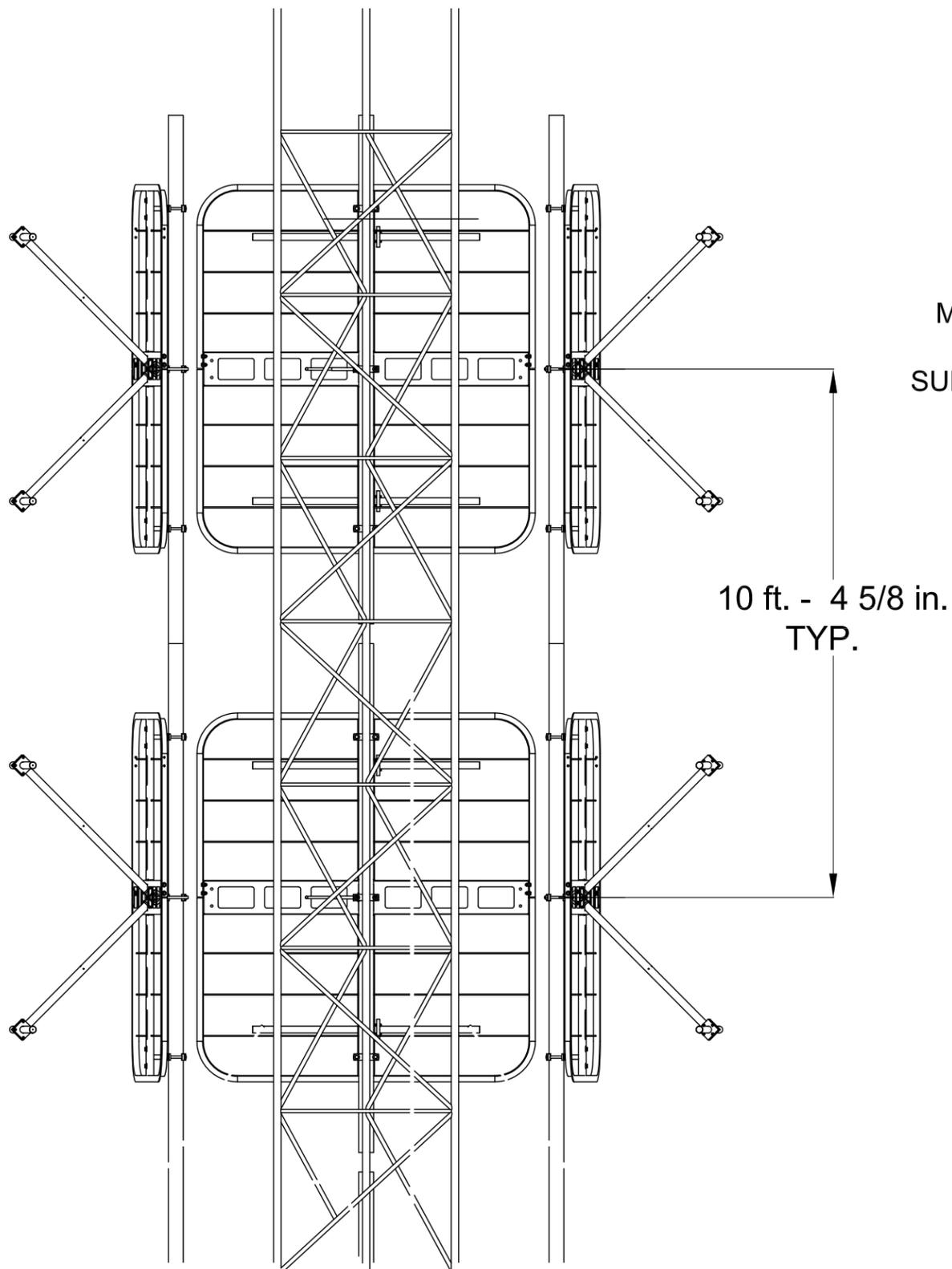
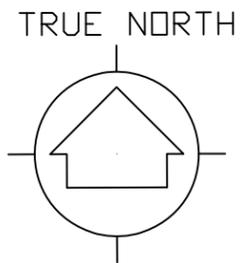
Tabulation of Composite Azimuth Pattern  
KRZU BATESVILLE, TX

Azimuth	Rel Field	Azimuth	Rel Field
0	0.925	180	0.569
10	0.977	190	0.716
20	0.976	200	0.854
30	0.913	210	0.952
40	0.821	220	0.995
45	0.811	225	1.000
50	0.833	230	0.961
60	0.966	240	0.841
70	0.989	250	0.823
80	0.925	260	0.874
90	0.837	270	0.963
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150	0.213	330	0.979
160	0.267	340	0.912
170	0.408	350	0.894

Figure 1F

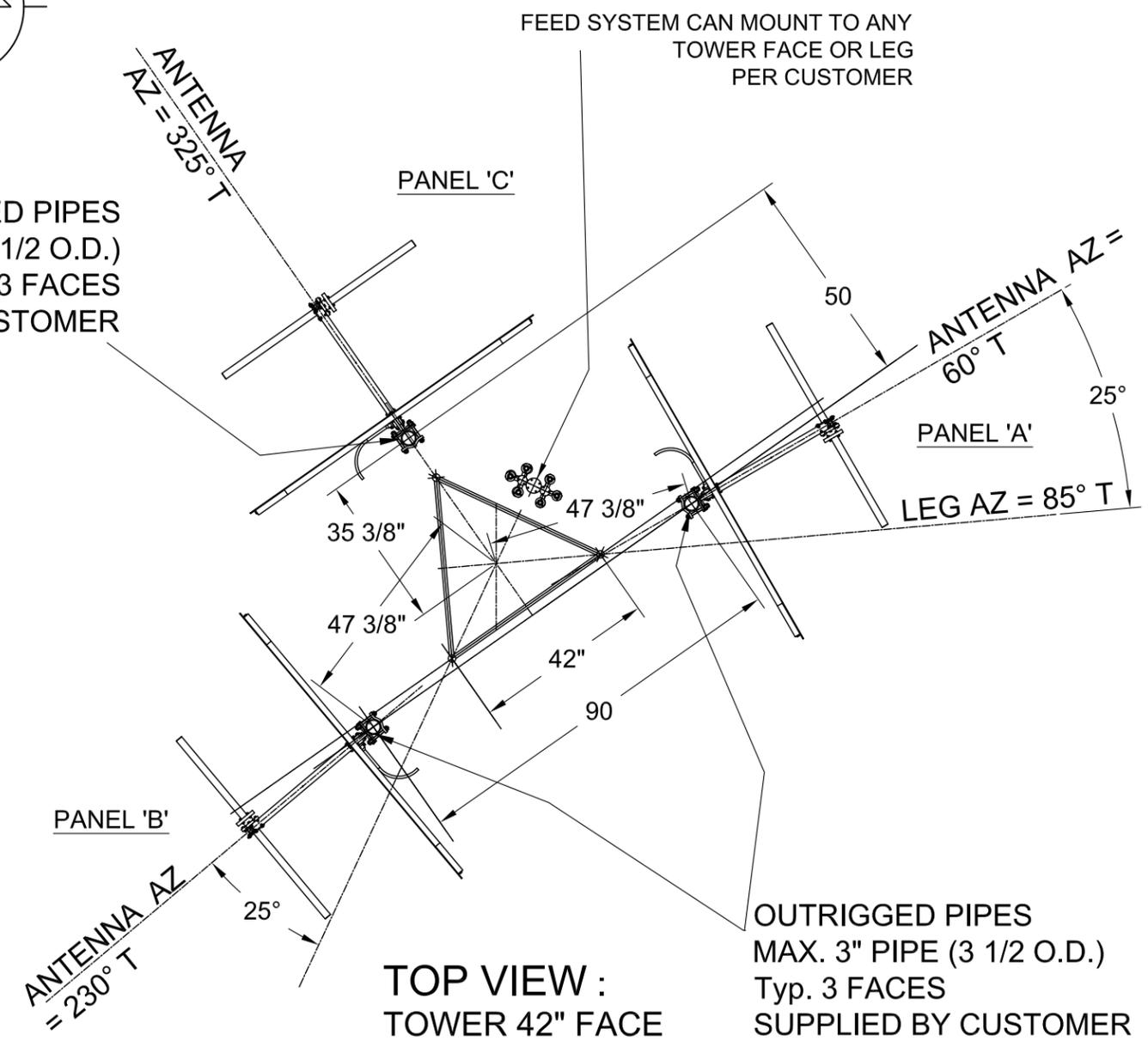
Tabulation of FCC Directional Composite  
KRZU BATESVILLE, TX

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	1.000
10	1.000	190	1.000
20	1.000	200	1.000
30	1.000	210	1.000
40	1.000	220	1.000
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	0.631	310	1.000
140	0.501	320	1.000
150	0.501	330	1.000
160	0.631	340	1.000
170	1.000	350	1.000



**SIDE VIEW LAYOUT**

OUTRIGGED PIPES  
MAX. 3" PIPE (3 1/2 O.D.)  
Typ. 3 FACES  
SUPPLIED BY CUSTOMER



**TOP VIEW :  
TOWER 42" FACE**

OUTRIGGED PIPES  
MAX. 3" PIPE (3 1/2 O.D.)  
Typ. 3 FACES  
SUPPLIED BY CUSTOMER

<b>SHIVELY LABS</b>			
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE			
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
30820	90.7	N.T.S.	DAB
TITLE:			APPROVED BY:
MODEL-6018H-8/3 DIRECTIONAL ANTENNA			ASP
DATE:	FIGURE 2		
7-2-13			

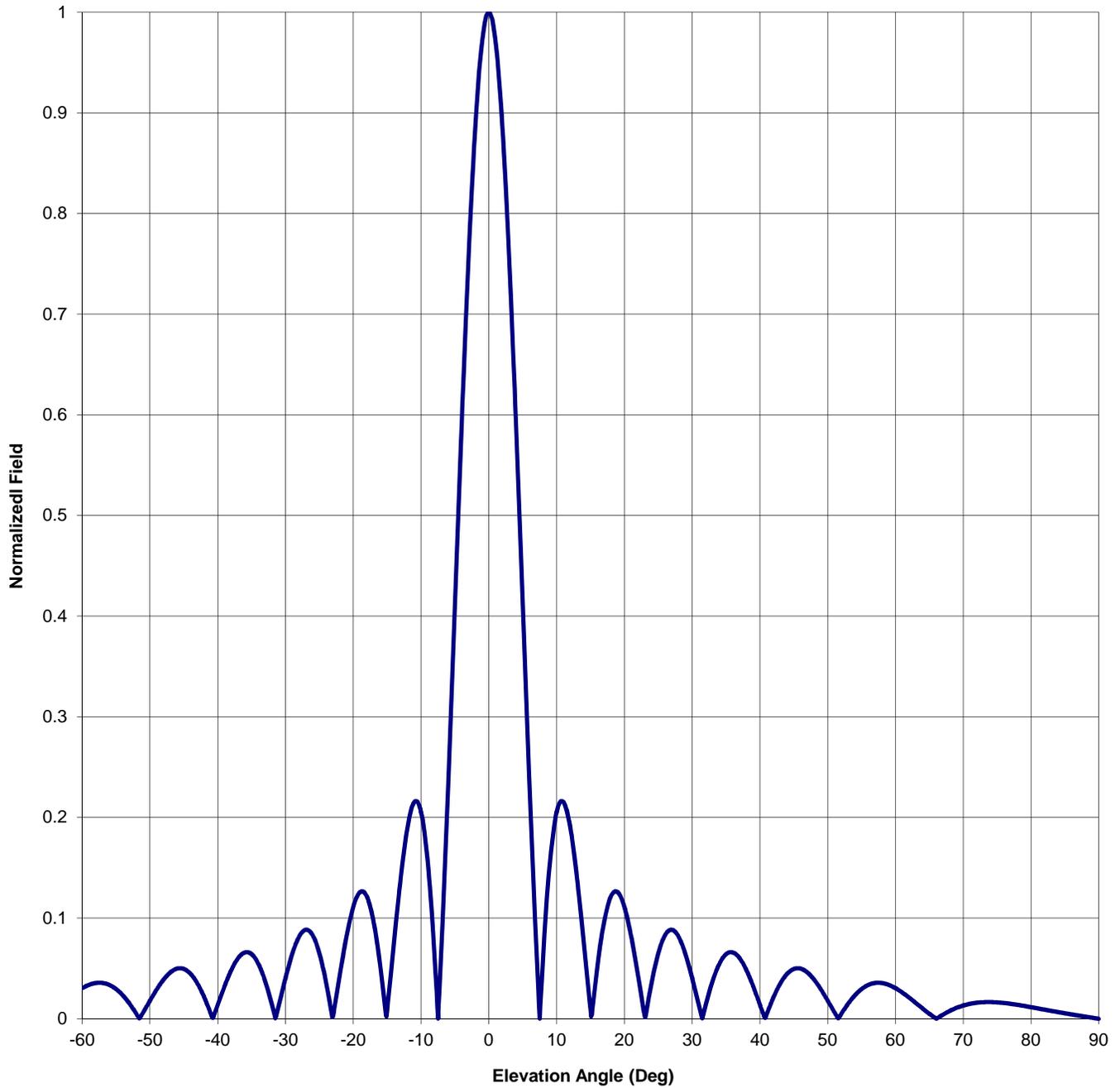
Antenna Mfg.: Shively Labs  
Antenna Type: 6018-8/3-H-DA

Date: 7/8/2013

Station: KRZU  
Frequency: 90.7  
Channel #: 214

Beam Tilt	0	
Gain (Max)	13.988	11.458 dB
Gain (Horizon)	13.988	11.458 dB

Figure: Figure 3



Antenna Mfg.: Shively Labs  
 Antenna Type: 6018-8/3-H-DA

Date: 7/8/2013

Station: KRZU  
 Frequency: 90.7  
 Channel #: 214

Beam Tilt 0  
 Gain (Max) 13.988 11.458 dB  
 Gain (Horizon) 13.988 11.458 dB

Figure: Figure 3

Angle of Depression (Deg)	Relative Field						
-90	0.000	-44	0.045	0	1.000	46	0.050
-89	0.001	-43	0.035	1	0.971	47	0.046
-88	0.002	-42	0.021	2	0.886	48	0.039
-87	0.003	-41	0.005	3	0.756	49	0.029
-86	0.004	-40	0.014	4	0.592	50	0.018
-85	0.006	-39	0.032	5	0.412	51	0.006
-84	0.007	-38	0.048	6	0.233	52	0.005
-83	0.008	-37	0.060	7	0.071	53	0.015
-82	0.009	-36	0.066	8	0.061	54	0.023
-81	0.010	-35	0.064	9	0.155	55	0.030
-80	0.012	-34	0.054	10	0.205	56	0.034
-79	0.013	-33	0.037	11	0.215	57	0.036
-78	0.014	-32	0.014	12	0.191	58	0.036
-77	0.015	-31	0.013	13	0.140	59	0.034
-76	0.016	-30	0.041	14	0.076	60	0.030
-75	0.016	-29	0.065	15	0.009	61	0.026
-74	0.017	-28	0.082	16	0.051	62	0.021
-73	0.017	-27	0.088	17	0.096	63	0.016
-72	0.016	-26	0.083	18	0.121	64	0.010
-71	0.015	-25	0.065	19	0.126	65	0.005
-70	0.013	-24	0.035	20	0.111	66	0.000
-69	0.011	-23	0.002	21	0.082	67	0.004
-68	0.008	-22	0.043	22	0.043	68	0.008
-67	0.004	-21	0.082	23	0.002	69	0.011
-66	0.000	-20	0.111	24	0.035	70	0.013
-65	0.005	-19	0.126	25	0.065	71	0.015
-64	0.010	-18	0.121	26	0.083	72	0.016
-63	0.016	-17	0.096	27	0.088	73	0.017
-62	0.021	-16	0.051	28	0.082	74	0.017
-61	0.026	-15	0.009	29	0.065	75	0.016
-60	0.030	-14	0.076	30	0.041	76	0.016
-59	0.034	-13	0.140	31	0.013	77	0.015
-58	0.036	-12	0.191	32	0.014	78	0.014
-57	0.036	-11	0.215	33	0.037	79	0.013
-56	0.034	-10	0.205	34	0.054	80	0.012
-55	0.030	-9	0.155	35	0.064	81	0.010
-54	0.023	-8	0.061	36	0.066	82	0.009
-53	0.015	-7	0.071	37	0.060	83	0.008
-52	0.005	-6	0.233	38	0.048	84	0.007
-51	0.006	-5	0.412	39	0.032	85	0.006
-50	0.018	-4	0.592	40	0.014	86	0.004
-49	0.029	-3	0.756	41	0.005	87	0.003
-48	0.039	-2	0.886	42	0.021	88	0.002
-47	0.046	-1	0.971	43	0.035	89	0.001
-46	0.050	0	1.000	44	0.045	90	0.000
-45	0.050			45	0.050		

S.O. [REDACTED]

VALIDATION OF TOTAL POWER GAIN CALCULATION

[REDACTED] KRZU Batesville, TX

[REDACTED] 6018-8/3-H-DA

Elevation Gain of Antenna [REDACTED] 9.544

H RMS [REDACTED] 0.826

Horizontal Azimuth Gain equals  $1/(\text{RMS})^2$  1.466

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

Total Horizontal Power Gain **13.988**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

[REDACTED] 100 kW ERP Divided by H Gain 13.988 Equals **7.149** kW Antenna Input Pow