

# *APPLICATION FOR LICENSE*

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NCE FM STATION WNRZ  
DICKSON, TENNESSEE  
FACILITY ID: 67638  
LMS FILE NO. 0000136589

COMMUNITY BROADCASTING, INC.

JULY 2021

## **APPLICATION FOR LICENSE**

The following engineering statement and attached exhibits have been prepared for **Community Broadcasting, Inc.** ("CBI"), licensee of NCE FM station WNRZ at Dickson, Tennessee, and are in support of their application for license.<sup>1</sup> This application seeks to cover the modification to the licensed facility under LMS File No. 0000136589. WNTZ is currently operating under the provisions of limited program test authority as described in Section 73.1620(a)(2) of the Commission's Rules.

WNRZ as authorized and constructed operates on FM channel 218 as a class C3 facility. The authorized maximum effective radiated power is 13 kW at a center of radiation of 78 meters above average terrain. This elevation corresponds to a center of radiation of 298 meters above mean sea level, or 54 meters above ground level. The facility was constructed with a Shively Labs model 6810-4R-EF-DA antenna. This is a directional antenna comprised of four elements spaced 1.0 wavelength apart. No beamtilt is employed by WNRZ. Construction of the facility has been completed in accordance with the terms of the construction permit.

The main studio complies with the provision of Section 73.1125 of the Commission's Rules. CBI maintains toll-free telephone access to its main studios throughout the coverage area of the facility, including Dickson, Tennessee, the community of license.

The specified transmitter power output achieves the authorized effective radiated power. The maximum authorized effective radiated power is 13 kW. The antenna utilized by the facility

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<sup>1</sup> The Facility ID for WNRZ at Dickson, Tennessee is 67638.

has a maximum numerical power gain of 4.065 as detailed in the attached proof of performance. The input power to the antenna to achieve the authorized effective radiated power is 3.20 kW.

Ahead of the antenna is the main run of transmission line. This run consists of 195 feet of Andrew/Commscope HJ7-50A transmission line. This line is a semi-flexible air dielectric coaxial cable with a nominal diameter of 1 5/8 inches. Data from the manufacturer indicates the insertion loss of this run of transmission line is 0.41 dB, which corresponds to an efficiency of 90.99 percent. The input power to the transmission line to achieve the authorized effective radiated power is 4.47 kW, which rounds to 4.5 kW per the provisions of Section 73.212 of the Commission's Rules. The input to the transmission line is the output of the transmitter, thus the specified transmitter power output achieves the authorized effective radiated power.

The construction permit as issued by the Commission lists five (5) special conditions or restrictions. Each of the special conditions or restrictions will be addressed in this technical exhibit.

The first of the special conditions, or restrictions, requires the submission of a directional proof of performance for the installed antenna. The required proof was provided to the licensee by Shively, the manufacturer of the antenna. The proof of performance is attached to this technical exhibit immediately following Exhibit E-1.

The second condition on the construction permit requires the submission of a certification executed by a licensed land surveyor attesting to the azimuth at which the antenna is oriented. Attached to this technical exhibit following the proof of performance is a statement from Steven D. Delle, RLS, of Delle Land Surveying Company, Inc. The stamped statement from Mr. Delle states

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P.O. Box 415  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
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the antenna is oriented at 111 degrees true, which is the azimuth specified in Figure 2 of the proof documentation.

The third condition on the permit requires the submission of an affidavit from a qualified engineer that the antenna was installed in accordance with the instructions provided by the manufacturer. Following the above discussed statement from Mr. Dell is a statement from Mr. Allan Brace, the Director of Engineering for Community Broadcasting, Inc., the licensee of WNRZ. The statement from Mr. Brace attests to the proper installation of the antenna under his supervision.

The fourth condition requires the submission of an exhibit demonstrating that the measured antenna pattern complies with the community coverage provisions of Section 73.515 of the Commission's Rules. Exhibit E-1 illustrates the predicted 60 dBu service contour based on the measured composite directional pattern. As the map demonstrates, that contour fully encompasses Dickson, Tennessee, the community of license.

The final special condition on the construction permit pertains to the directional antenna itself. This condition summarizes parameters associated with the directional antenna, and states the principal minima and maximum effective radiated power. This condition is informational in nature.

Additionally, CBI certifies that it will coordinate with all other users of the site to ensure that workers and other personnel are not exposed to levels of radiofrequency radiation in excess of the

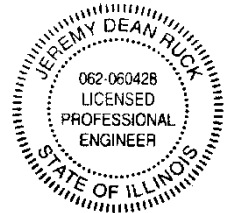
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applicable safety standards. Coordination activities will include, but are not necessarily limited to a reduction in transmitter power, or cessation of operation.

The preceding statement and attached exhibits have been prepared by me, or under my direction, and are true and accurate to the best of my belief and knowledge.



Above signature is digitized copy of actual signature  
License Expires November 30, 2021

Jeremy D. Ruck, PE  
July 16, 2021

JEREMY RUCK & ASSOCIATES, INC.

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Canton, IL 61520

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**WNRZ.C**

0000136589

Latitude: 36-00-37 N

Longitude: 087-30-47.30 W

ERP: 13.00 kW

Channel: 218

Frequency: 91.5 MHz

AMSL Height: 298.0 m

Elevation: 244.0 m

Horiz. Pattern: Directional

Vert. Pattern: No

Prop Model: FCC Contour

Jeremy Ruck &amp; Associates, Inc.

- WNRZ Measured Pattern 60 dBu Service Contour
- City of License - Dickson, Tennessee

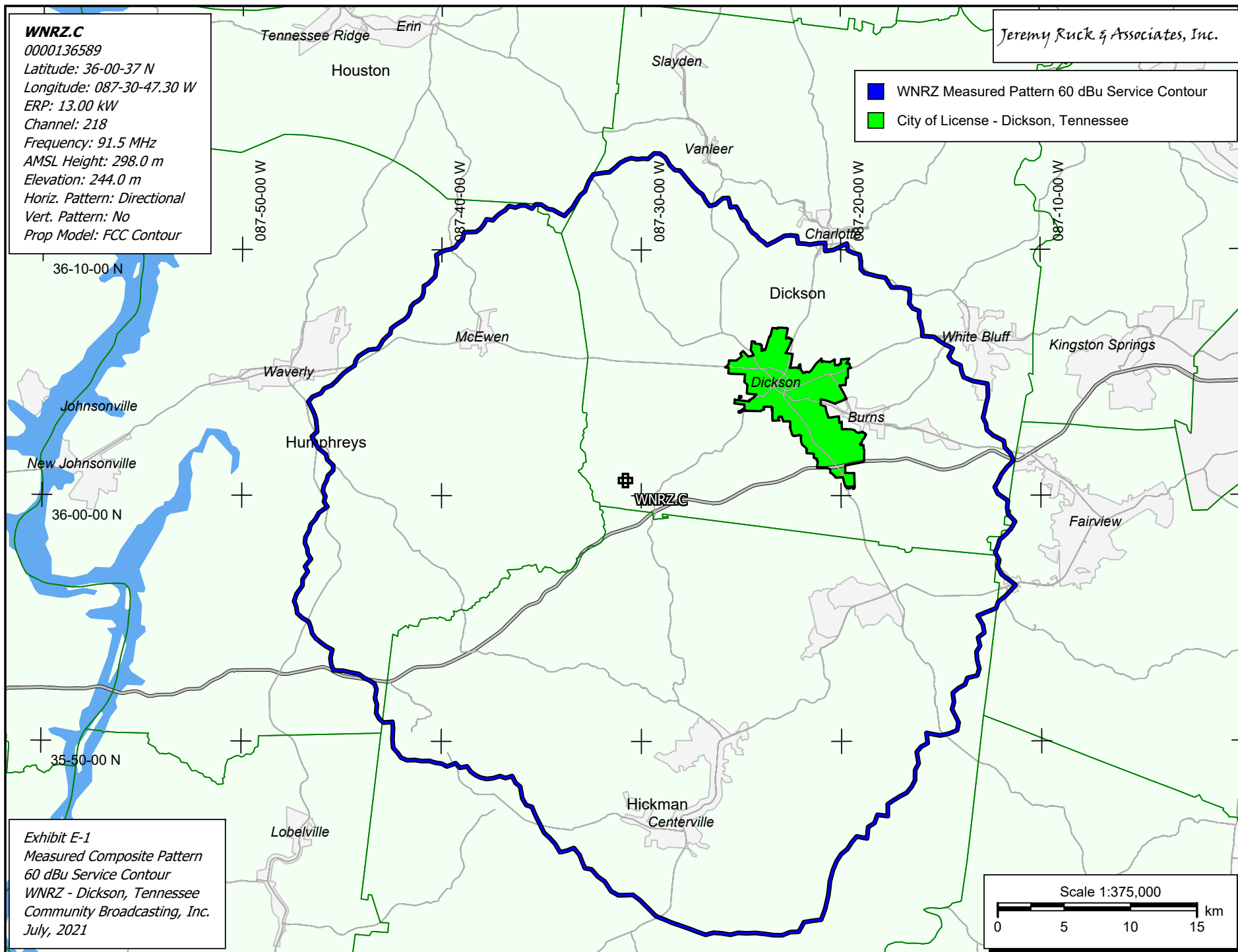


Exhibit E-1  
Measured Composite Pattern  
60 dBu Service Contour  
WNRZ - Dickson, Tennessee  
Community Broadcasting, Inc.  
July, 2021

**S.O. 37611**  
**Report of Test 6810-4R-EF-DA**  
**for**  
**COMMUNITY BROADCASTING Inc.**  
**WNRZ 91.5 MHz DICKSON, TN**

**OBJECTIVE:**

The objective of this test was to demonstrate the directional characteristics of a 6810-4R-EF-DA to meet the needs of WNRZ and to comply with the requirements of the FCC construction permit, file number 0000136589. 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 0000136589 indicates that the Horizontal radiation component shall not exceed 13 kW at any azimuth and is restricted to the following values at the azimuths specified:

300 Degrees True: 2.7 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 150 Degrees True to 155 Degrees True. At the restricted azimuth of 300 Degrees True the Horizontal component is 6.858 dB down from the maximum of 13 kW, or 2.679 kW.

The R.M.S. of the Horizontal component is 0.760. The total Horizontal power gain is 4.065 dB. The R.M.S. of the Vertical component is 0.692. The total Vertical power gain is 4.008 dB. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.829. The R.M.S. of the measured composite pattern is 0.773. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.705. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

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

One bay of the 6810-4R-EF-DA was mounted on a tower of precise scale to the Rohn 45 tower at the WNRZ site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1A. 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 1A was achieved. See Figure 2 for mechanical details.

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

As allowed by the construction permit, file number 0000136589, a single level of the 6810-4R-EF-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 parabolic dish 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 Hypercell Superflex and Cellflex ICF cabling respectively.



The control building is equipped with:

Hewlett Packard Model 4395-A Network Analyzer

PC Based Controller

Output Standard Printer or 'pdf'

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

**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 411.75 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:

A handwritten signature in cursive script that reads "Sean C. Edwards".

Sean C. Edwards  
Director RF Engineering, Shively Labs

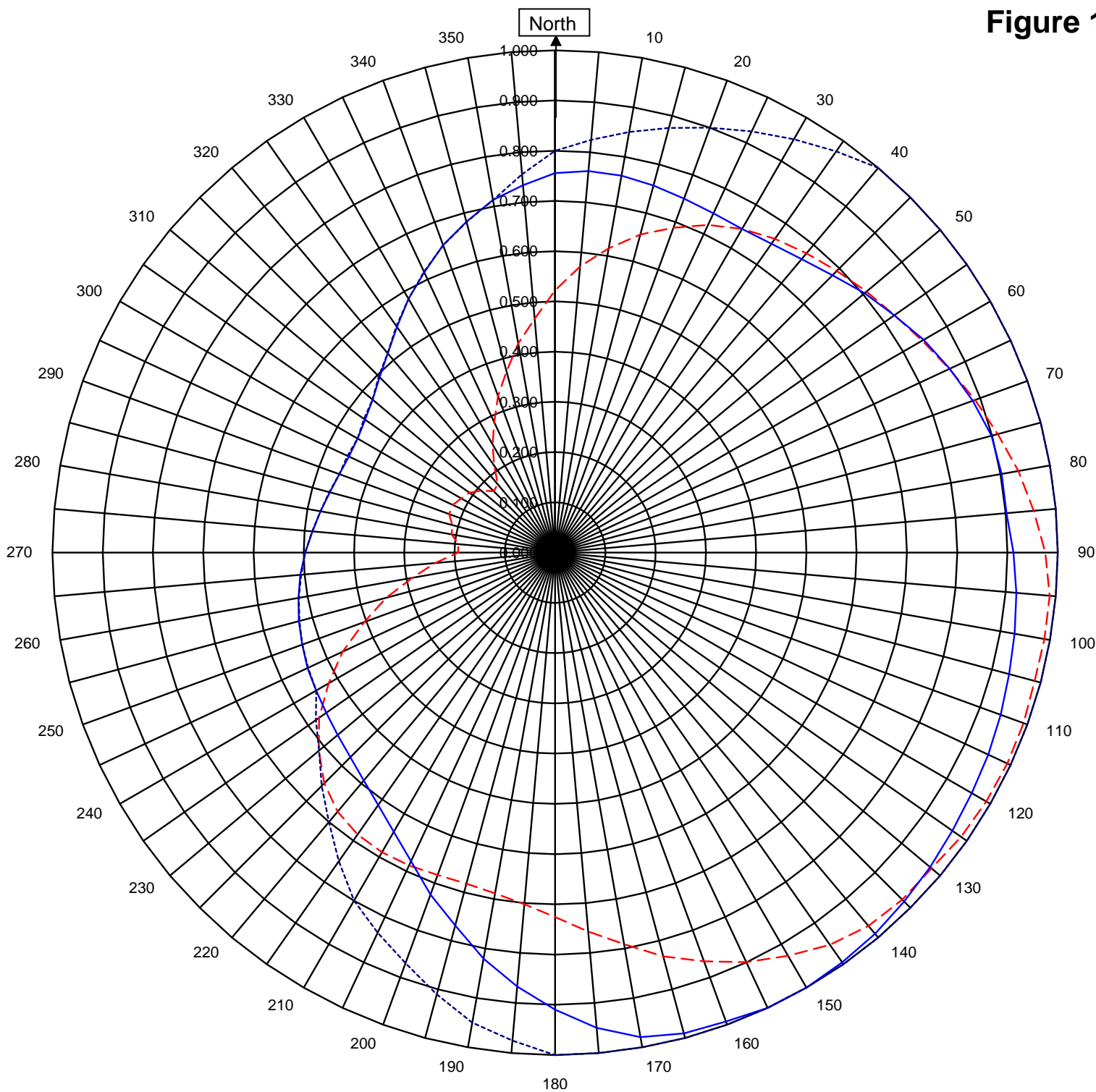
S/O: 37611

Date: 16 April 2021

# Shively Labs

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

Figure 1A



**WNRZ                      DICKSON, TN**  
37611  
February 13, 2021

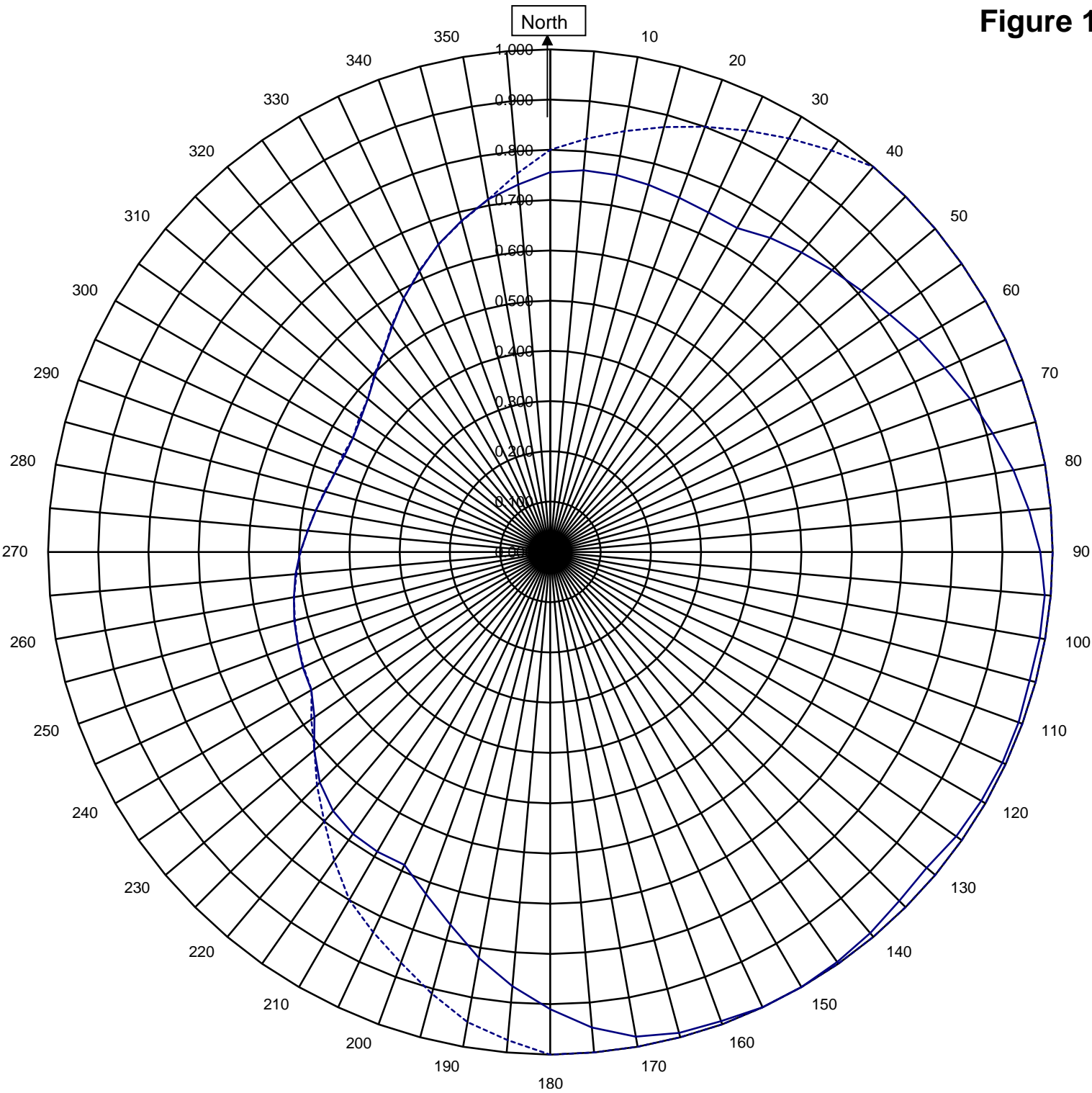
<div>Horizontal RMS</div>	0.760	Frequency	91.5    /    411.75    mHz
<div>Vertical RMS</div>	0.692	Plot	Relative Field
H/V Composite   RMS	0.773	Scale	4.5 : 1
.....FCC Composite RMS	0.829		See Figure 2 for Mechanical Details

Antenna Model	6810-4R-EF-DA
Pattern Type	Directional Azimuth

# Shively Labs

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Figure 1B



**WNRZ      DICKSON, TN**  
37611  
February 13, 2021

 H/V Composite RMS	0.773
 FCC Composite RMS	0.829

Frequency	91.5    /    411.75    mHz
Plot	Relative Field
Scale	4.5 : 1
See Figure 2 for Mechanical Details	

Antenna Model	6810-4R-EF-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern  
WNRZ DICKSON, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.755	180	0.910
10	0.762	190	0.821
20	0.750	200	0.724
30	0.744	210	0.642
40	0.763	220	0.592
45	0.781	225	0.576
50	0.804	230	0.565
60	0.847	240	0.549
70	0.884	250	0.535
80	0.902	260	0.518
90	0.912	270	0.497
100	0.928	280	0.474
110	0.944	290	0.457
120	0.957	300	0.454
130	0.974	310	0.474
135	0.982	315	0.494
140	0.990	320	0.518
150	1.000	330	0.583
160	0.993	340	0.651
170	0.979	350	0.712

Figure 1D

Tabulation of Vertical Azimuth Pattern  
WNRZ DICKSON, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.522	180	0.725
10	0.615	190	0.688
20	0.688	200	0.683
30	0.744	210	0.689
40	0.778	220	0.673
45	0.793	225	0.649
50	0.808	230	0.613
60	0.844	240	0.520
70	0.889	250	0.404
80	0.936	260	0.288
90	0.975	270	0.193
100	0.989	280	0.209
110	0.992	290	0.224
120	0.990	300	0.215
130	0.978	310	0.192
135	0.977	315	0.173
140	0.970	320	0.178
150	0.927	330	0.249
160	0.866	340	0.332
170	0.792	350	0.423

Figure 1E

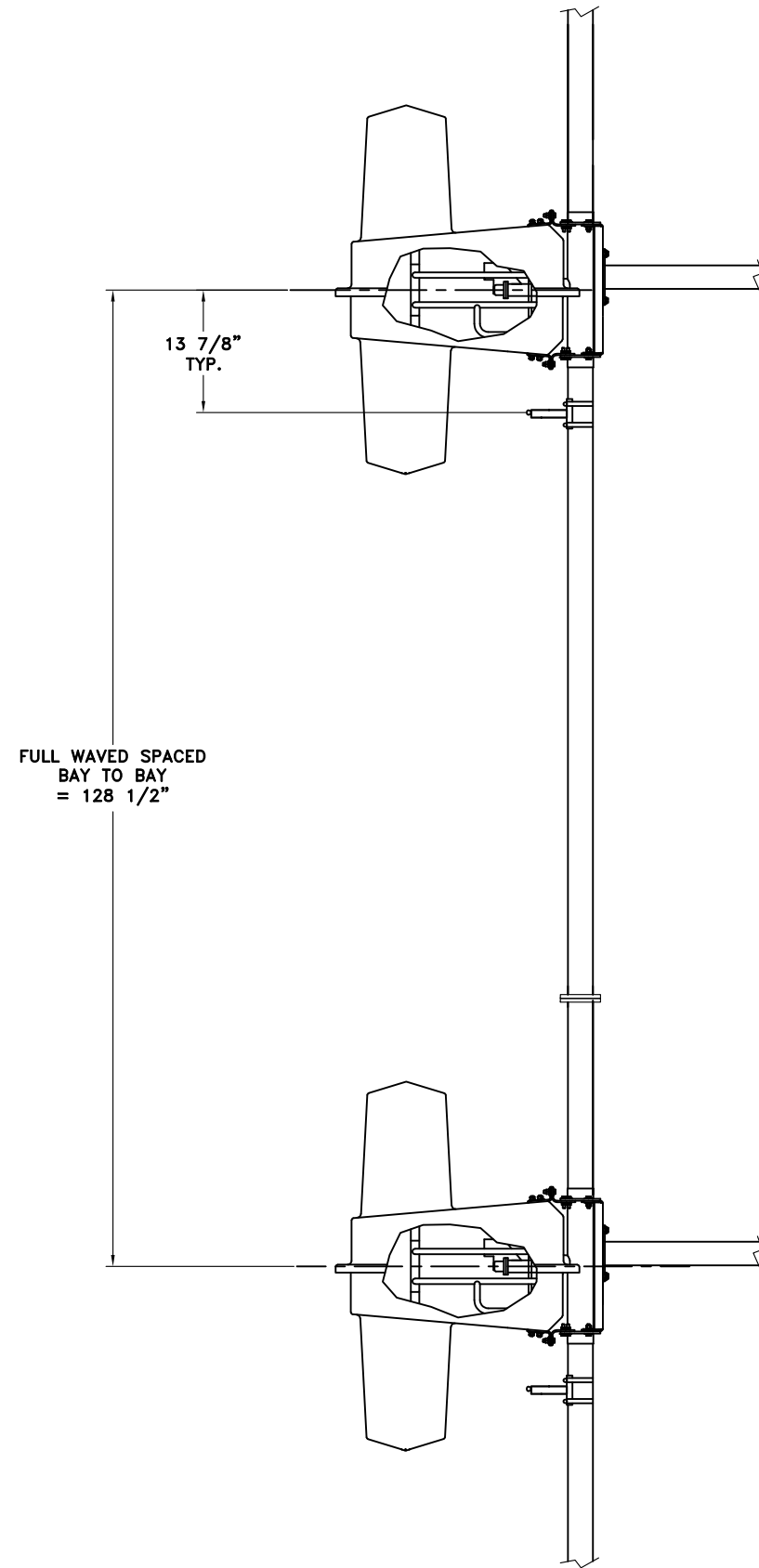
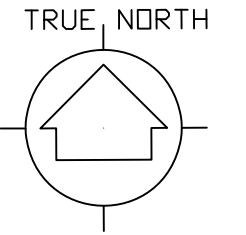
Tabulation of Composite Azimuth Pattern  
WNRZ DICKSON, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.755	180	0.910
10	0.762	190	0.821
20	0.750	200	0.724
30	0.744	210	0.689
40	0.778	220	0.673
45	0.793	225	0.649
50	0.808	230	0.613
60	0.847	240	0.549
70	0.889	250	0.535
80	0.936	260	0.518
90	0.975	270	0.497
100	0.989	280	0.474
110	0.992	290	0.457
120	0.990	300	0.454
130	0.978	310	0.474
135	0.982	315	0.494
140	0.990	320	0.518
150	1.000	330	0.583
160	0.993	340	0.651
170	0.979	350	0.712

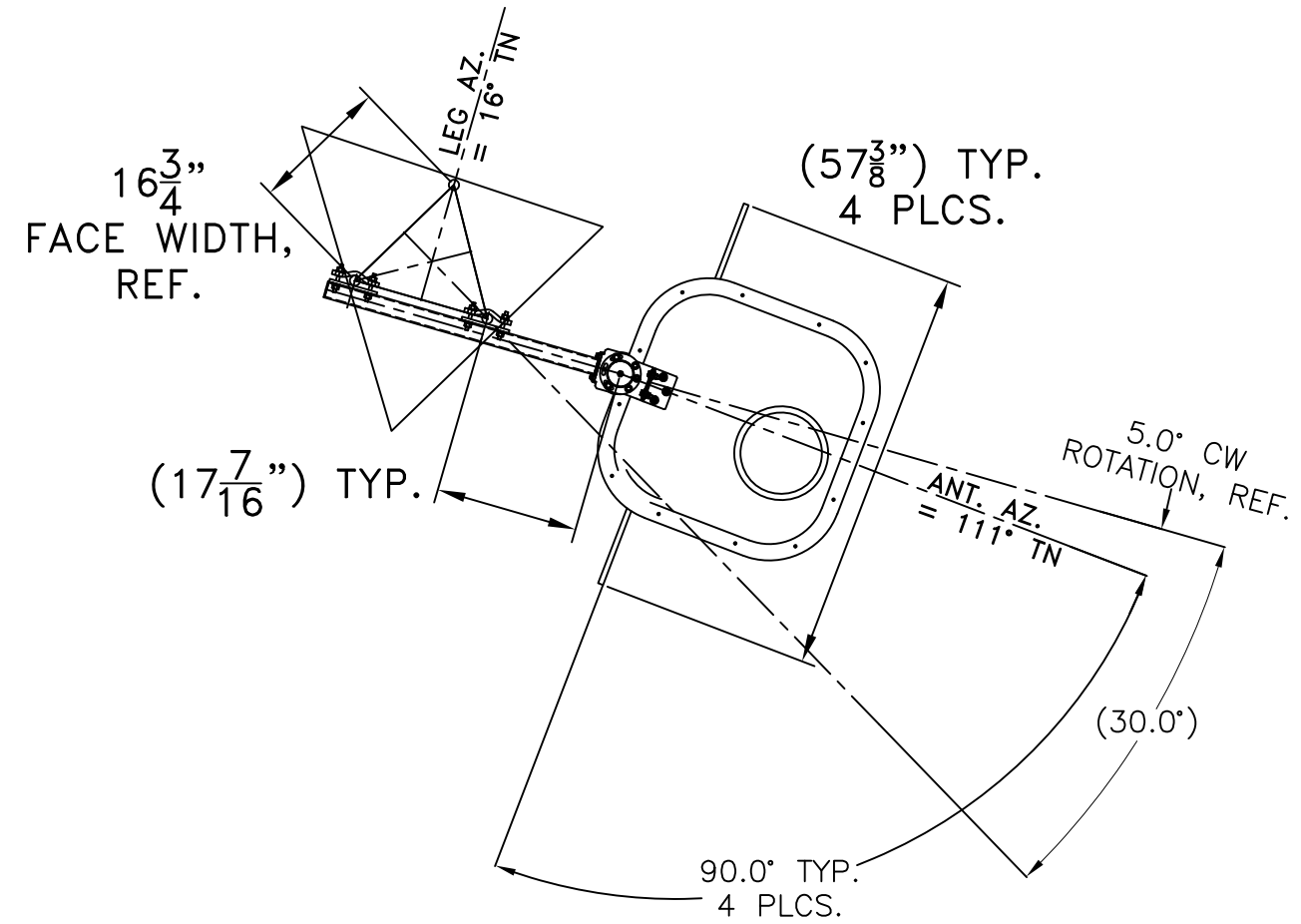
Figure 1F

Tabulation of FCC Directional Composite  
WNRZ DICKSON, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.800	180	1.000
10	0.850	190	0.950
20	0.900	200	0.870
30	0.950	210	0.800
40	1.000	220	0.700
50	1.000	230	0.613
60	1.000	240	0.549
70	1.000	250	0.535
80	1.000	260	0.518
90	1.000	270	0.497
100	1.000	280	0.474
110	1.000	290	0.457
120	1.000	300	0.454
130	1.000	310	0.474
140	1.000	320	0.518
150	1.000	330	0.583
160	1.000	340	0.651
170	1.000	350	0.712



SIDE VIEW



TOP VIEW

TOWER: ROHN 45G

ANTENNA HEADING 111° TRUE NORTH

SHIVELY LABS			
A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
37611	91.5 MHz	N.T.S.	JHFF
			APPROVED BY: ASP
TITLE: MODEL-6810-4R-EF-DA DIRECTIONAL ANTENNA			
DATE:			
2-23-21	FIGURE 2		

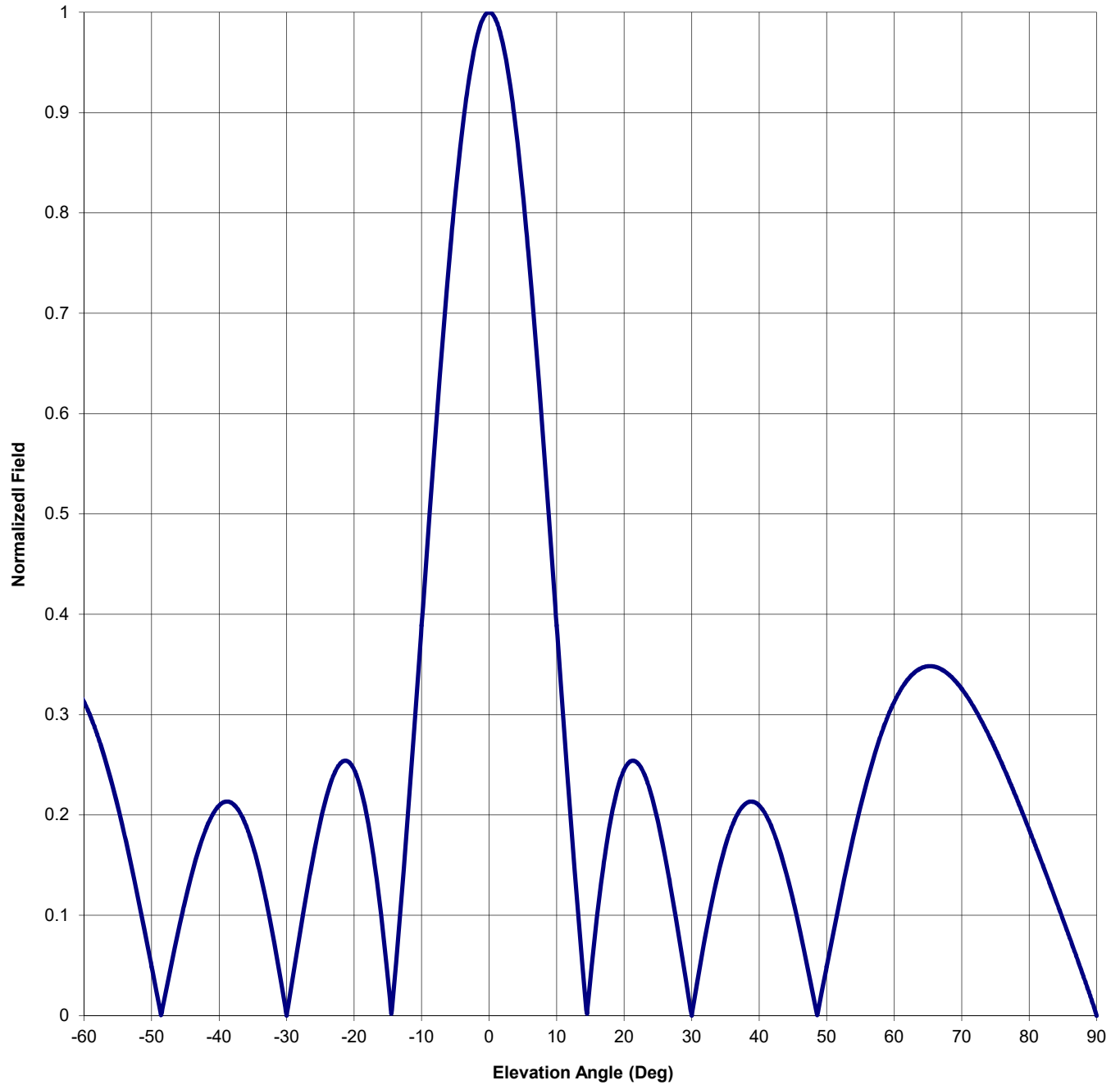


Antenna Mfg.: Shively Labs  
Antenna Type: 6810-4R-EF-DA

Date: 2/23/2021

Station: WNRZ  
Frequency: 91.5  
Channel #: 218  
Figure: Figure 3

Beam Tilt	0	
Gain (Max)	4.065	6.091 dB
Gain (Horizon)	4.065	6.091 dB



Antenna Mfg.: Shively Labs  
Antenna Type: 6810-4R-EF-DA

Date: 2/23/2021

Station: WNRZ

Beam Tilt 0

Frequency: 91.5

Gain (Max) 4.065

6.091 dB

Channel #: 218

Gain (Horizon) 4.065

6.091 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	0.143	0	1.000	46	0.086
-89	0.021	-43	0.166	1	0.992	47	0.054
-88	0.040	-42	0.185	2	0.970	48	0.020
-87	0.059	-41	0.200	3	0.932	49	0.014
-86	0.078	-40	0.209	4	0.882	50	0.049
-85	0.096	-39	0.213	5	0.819	51	0.083
-84	0.114	-38	0.211	6	0.746	52	0.117
-83	0.132	-37	0.203	7	0.664	53	0.149
-82	0.150	-36	0.189	8	0.576	54	0.180
-81	0.168	-35	0.169	9	0.483	55	0.208
-80	0.185	-34	0.144	10	0.389	56	0.234
-79	0.202	-33	0.114	11	0.295	57	0.258
-78	0.219	-32	0.079	12	0.203	58	0.279
-77	0.235	-31	0.041	13	0.116	59	0.297
-76	0.251	-30	0.000	14	0.036	60	0.313
-75	0.265	-29	0.042	15	0.037	61	0.325
-74	0.280	-28	0.083	16	0.100	62	0.335
-73	0.293	-27	0.124	17	0.153	63	0.342
-72	0.305	-26	0.161	18	0.195	64	0.346
-71	0.316	-25	0.194	19	0.226	65	0.348
-70	0.326	-24	0.221	20	0.245	66	0.348
-69	0.334	-23	0.240	21	0.254	67	0.345
-68	0.341	-22	0.252	22	0.252	68	0.341
-67	0.345	-21	0.254	23	0.240	69	0.334
-66	0.348	-20	0.245	24	0.221	70	0.326
-65	0.348	-19	0.226	25	0.194	71	0.316
-64	0.346	-18	0.195	26	0.161	72	0.305
-63	0.342	-17	0.153	27	0.124	73	0.293
-62	0.335	-16	0.100	28	0.083	74	0.280
-61	0.325	-15	0.037	29	0.042	75	0.265
-60	0.313	-14	0.036	30	0.000	76	0.251
-59	0.297	-13	0.116	31	0.041	77	0.235
-58	0.279	-12	0.203	32	0.079	78	0.219
-57	0.258	-11	0.295	33	0.114	79	0.202
-56	0.234	-10	0.389	34	0.144	80	0.185
-55	0.208	-9	0.483	35	0.169	81	0.168
-54	0.180	-8	0.576	36	0.189	82	0.150
-53	0.149	-7	0.664	37	0.203	83	0.132
-52	0.117	-6	0.746	38	0.211	84	0.114
-51	0.083	-5	0.819	39	0.213	85	0.096
-50	0.049	-4	0.882	40	0.209	86	0.078
-49	0.014	-3	0.932	41	0.200	87	0.059
-48	0.020	-2	0.970	42	0.185	88	0.040
-47	0.054	-1	0.992	43	0.166	89	0.021
-46	0.086	0	1.000	44	0.143	90	0.000
-45	0.116			45	0.116		

S.O. 37611

Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WNRZ DICKSON, TN

MODEL 6810-4R-EF-DA

Elevation Gain of Antenna 2.137

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

H RMS 0.759909 V RMS 0.691888 H/V Ratio 1.098

Elevation Gain of Horizontal Component 2.347

Elevation Gain of Vertical Component 1.946

Horizontal Azimuth Gain equals  $1/(\text{RMS})^2$ . 1.732

Vertical Azimuth Gain equals  $1/(\text{RMS}/\text{Max Vert})^2$ . 2.060

Max. Vertical 0.993

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

Total Horizontal Power Gain = 4.065

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

Total Vertical Power Gain = 4.008

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ERP divided by Horizontal Power Gain equals Antenna Input Power

13 kW ERP Divided by H Gain 4.065 equals 3.198 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

3.198 kW Times V Gain 4.008 equals 12.819 kW V ERP

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

$(0.993)^2$  Times 13.00 Equals 12.819 kW Vertical ERP

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

# Delle Land Surveying Company, Inc.

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1104 Pardue Rd, Ashland City, TN 37015

Ph. # 615-642-9146

Email~delleland@comcast.net

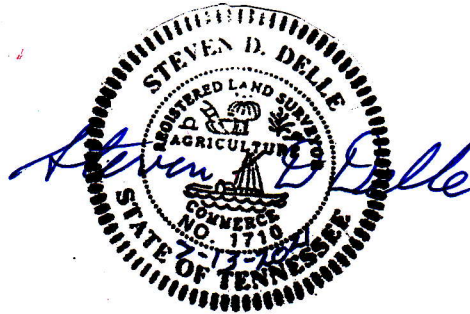
700 Sam Hollow Road  
Dickson, TN 37055

Dear Sirs,

This letter is to certify that Delle Land Surveying Co. Inc. surveyed the antenna at 700 Sam Hollow Road on 7-09-2021 and found the antenna to be located at Latitude N 36° 00' 37.0" and Longitude 87° 30' 46.8" and at an azimuth of 111° from true north.

*Steven D Delle*

Steven D. Delle RLS # 1710 TN  
Owner, Delle Land Surveying



July 14, 2021

Radio Station WNRZ  
700 Sam Hollow Road  
Dickson, TN

A new, Shively 6810-4R-EF-DA-91.50, four element, antenna was purchased and installed as part of the Construction Permit, File number 0000136589, granted for an increase in power utilizing a Directional Antenna system.

All assembly and installation of the antenna system was overseen by the undersigned, following the installation instructions provided by the manufacturer of the antenna and per the referenced Construction Permit above.

The undersigned certifies that he has overseen many similar installations and has more than 40 years of broadcast engineering experience, whose work has been accepted by the Commission and is a matter of record. He further certifies that he is currently employed as Corporate Director of Engineering for Community Broadcasting, Inc., 10550 Barkley, Suite 100, Overland Park, KS 66212.



Allan B. Brace  
Corporate Director of Engineering  
Community Broadcasting, Inc