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S.O. 36766

Report of Test 6810-1R-DA

for

SANTA FE COMMUNITY COLLEGE

KSFR-FM 101.1 MHz SANTE FE, NM.

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-1R-DA to meet the needs of KSFR-FM and to comply with the requirements of the FCC construction permit, file number 0000094261. 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 0000094261 indicates that the Horizontal radiation component shall not exceed 2.9 kW at any azimuth and is restricted to the following values at the azimuths specified:

190 Degrees True: 0.696 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 130 - 135 Degrees True. At the restricted azimuth of 190 Degrees True the Vertical component is 8.16 dB down from the maximum of 2.9 kW, or 0.443 Kw.

The R.M.S. of the Horizontal component is 0.777. The total Horizontal power gain is 0.779. The R.M.S. of the Vertical component is 0.750. The total Vertical power gain is 0.765. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.949. The R.M.S. of the measured composite pattern is 0.807. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.807. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-1R-DA was mounted on a tower of precise scale to the WSST tower at the KSFR-FM 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 0000094261, a single level of the 6810-1R 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 lCF 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 454.95 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:

Angela Gillespie
Vice President, Shively Labs

S/O 36766
Date September 4, 2020

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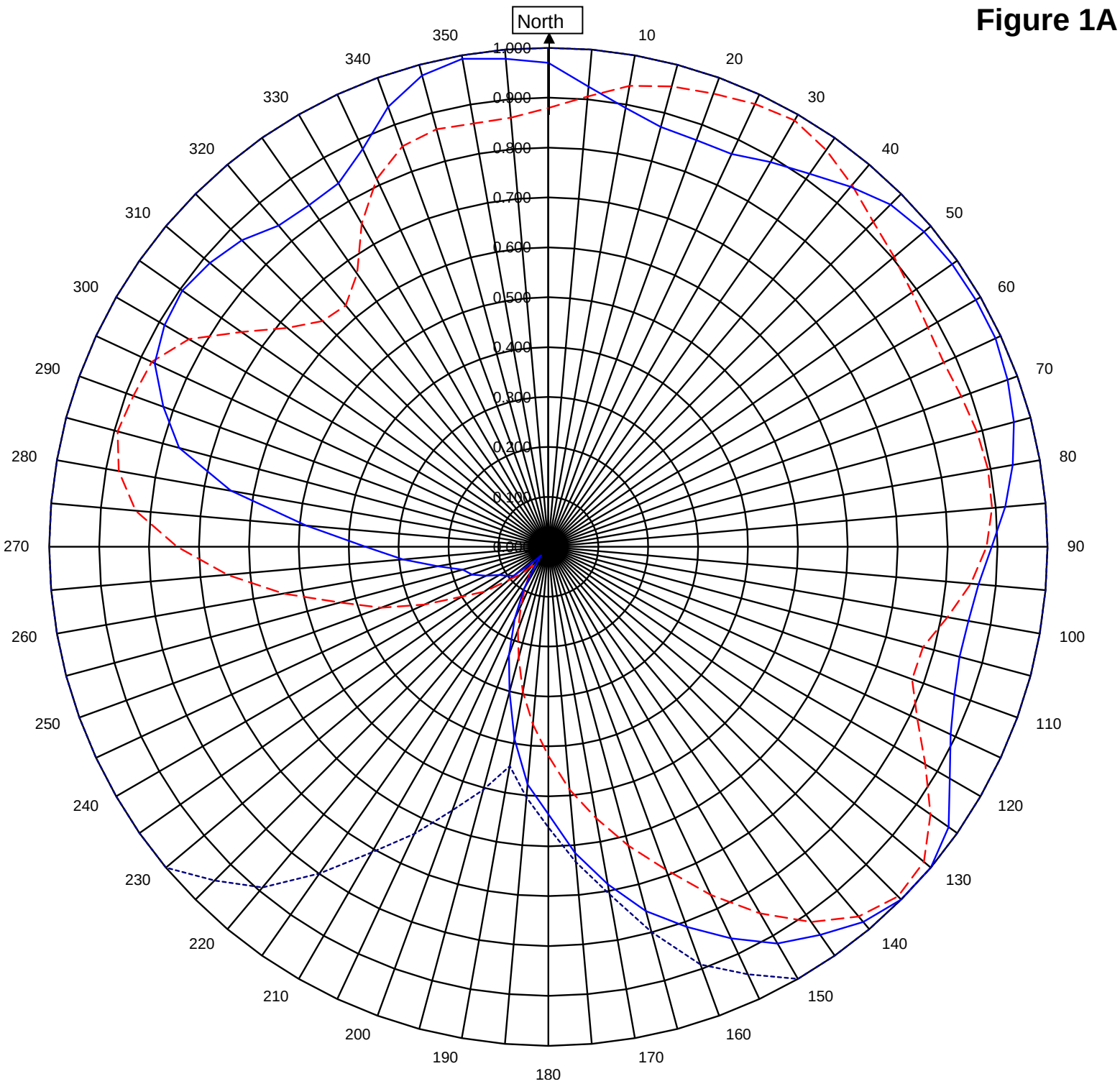
Figure 1A



KSFR WHITE ROCK

36766

September 2, 2020

Horizontal RMS	0.777
Vertical RMS	0.750
H/V Composite RMS	0.807
FCC Composite RMS	0.949

Frequency	101.1 / 454.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-1R-DA
Pattern Type	Directional Azimuth

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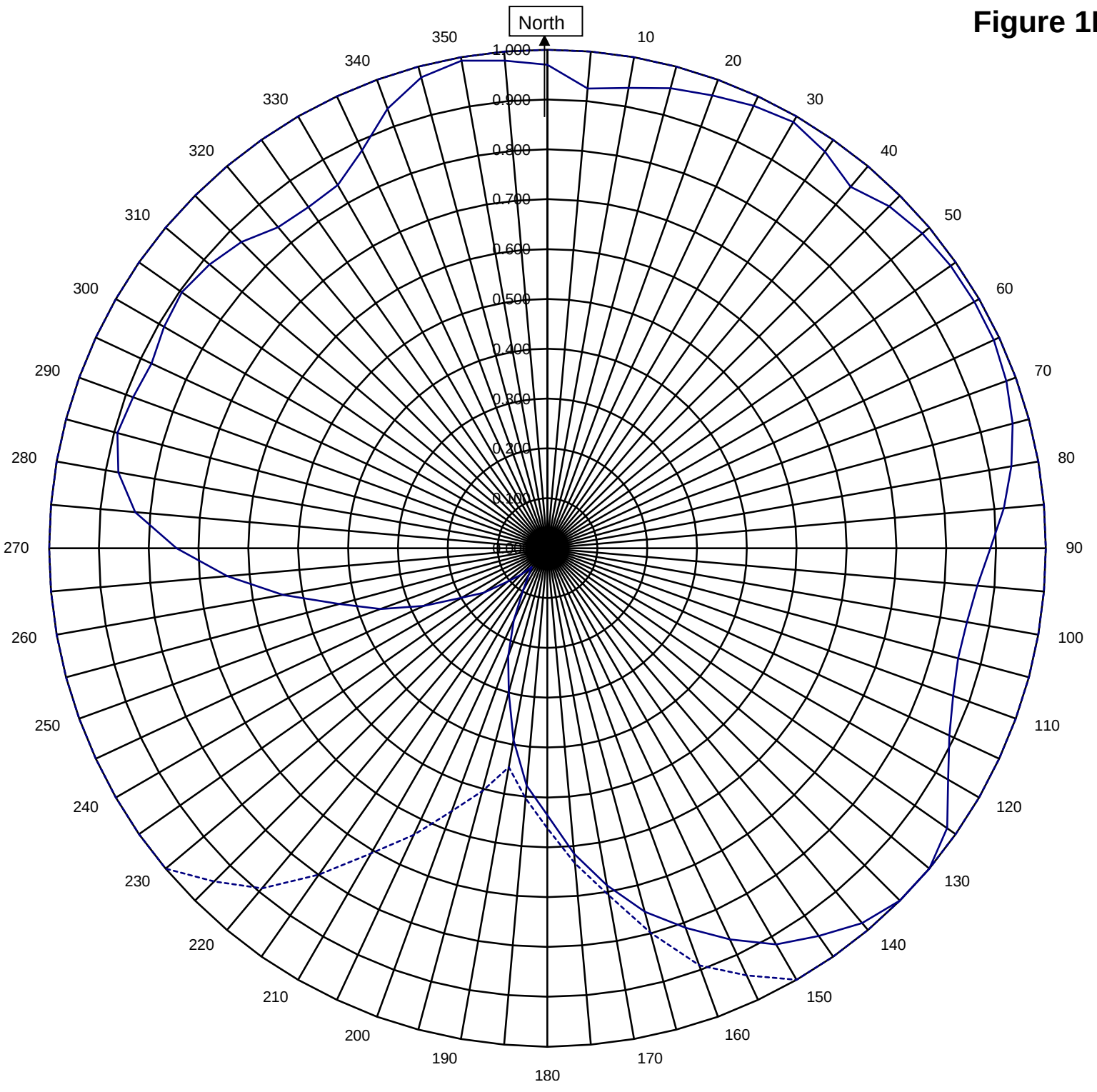
Figure 1B



KSFR WHITE ROCK

36766

September 2, 2020

_____H/VComposite RMS	0.807
……..FCC Composite RMS	0.949

Frequency	101.1 / 454.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-1R-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
KSFR WHITE ROCK

Azimuth	Rel Field	Azimuth	Rel Field
0	0.970	180	0.536
10	0.893	190	0.391
20	0.867	200	0.231
30	0.890	210	0.099
40	0.942	220	0.022
45	0.969	225	0.039
50	0.982	230	0.091
60	0.989	240	0.113
70	0.979	250	0.162
80	0.945	260	0.225
90	0.889	270	0.367
100	0.855	280	0.646
110	0.866	290	0.821
120	0.929	300	0.888
130	1.000	310	0.885
135	1.000	315	0.869
140	0.981	320	0.840
150	0.918	330	0.841
160	0.810	340	0.938
170	0.687	350	0.993

Figure 1D

Tabulation of Vertical Azimuth Pattern
KSFR WHITE ROCK

Azimuth	Rel Field	Azimuth	Rel Field
0	0.879	180	0.419
10	0.938	190	0.294
20	0.966	200	0.179
30	0.987	210	0.093
40	0.946	220	0.049
45	0.921	225	0.076
50	0.904	230	0.104
60	0.878	240	0.199
70	0.881	250	0.356
80	0.894	260	0.539
90	0.878	270	0.744
100	0.812	280	0.874
110	0.776	290	0.885
120	0.872	300	0.832
130	0.982	310	0.683
135	0.991	315	0.640
140	0.967	320	0.632
150	0.848	330	0.748
160	0.688	340	0.854
170	0.552	350	0.861

Figure 1E

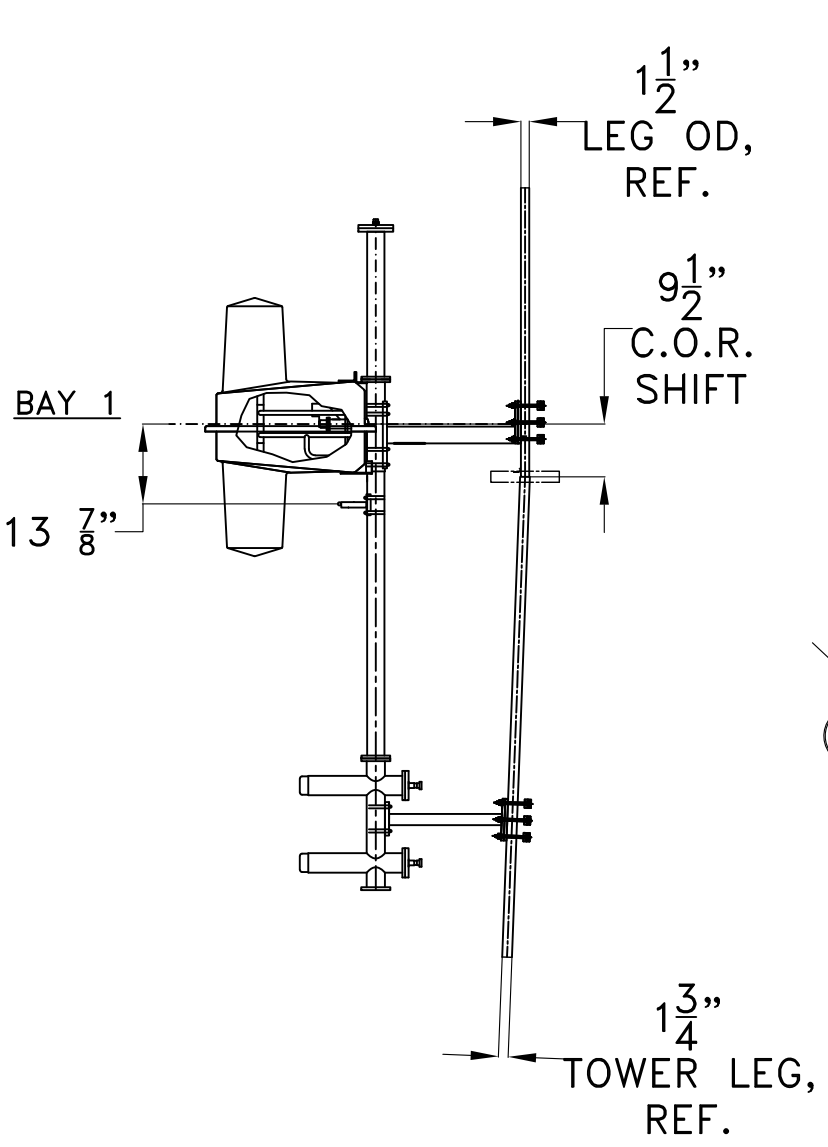
Tabulation of Composite Azimuth Pattern
KSFR WHITE ROCK

Azimuth	Rel Field	Azimuth	Rel Field
0	0.970	180	0.536
10	0.938	190	0.391
20	0.966	200	0.231
30	0.987	210	0.099
40	0.946	220	0.049
45	0.969	225	0.076
50	0.982	230	0.104
60	0.989	240	0.199
70	0.979	250	0.356
80	0.945	260	0.539
90	0.889	270	0.744
100	0.855	280	0.874
110	0.866	290	0.885
120	0.929	300	0.888
130	1.000	310	0.885
135	1.000	315	0.869
140	0.981	320	0.840
150	0.918	330	0.841
160	0.810	340	0.938
170	0.687	350	0.993

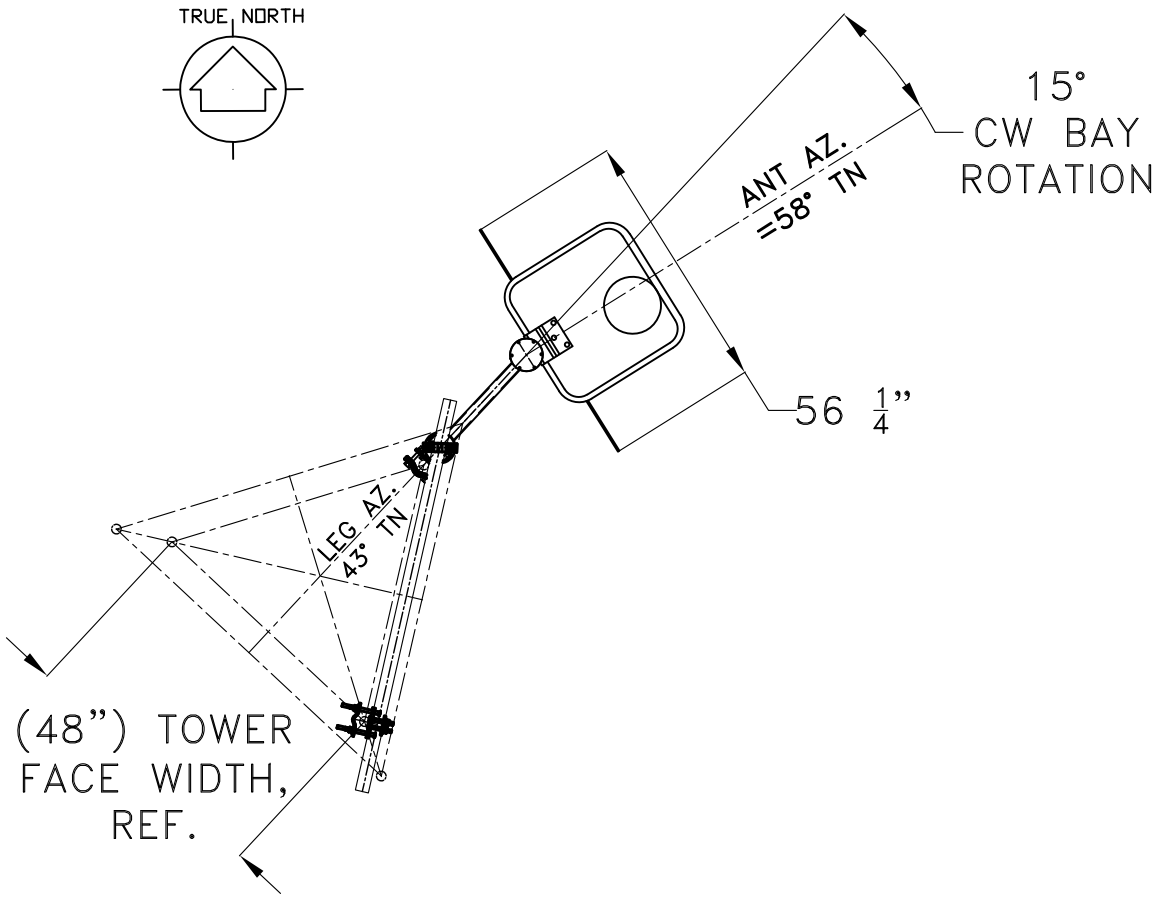
Figure 1F

Tabulation of FCC Directional Composite
KSFR WHITE ROCK

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.562
10	1.000	190	0.446
20	1.000	200	0.562
30	1.000	210	0.707
40	1.000	220	0.891
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	0.891	340	1.000
170	0.707	350	1.000



SIDE VIEW



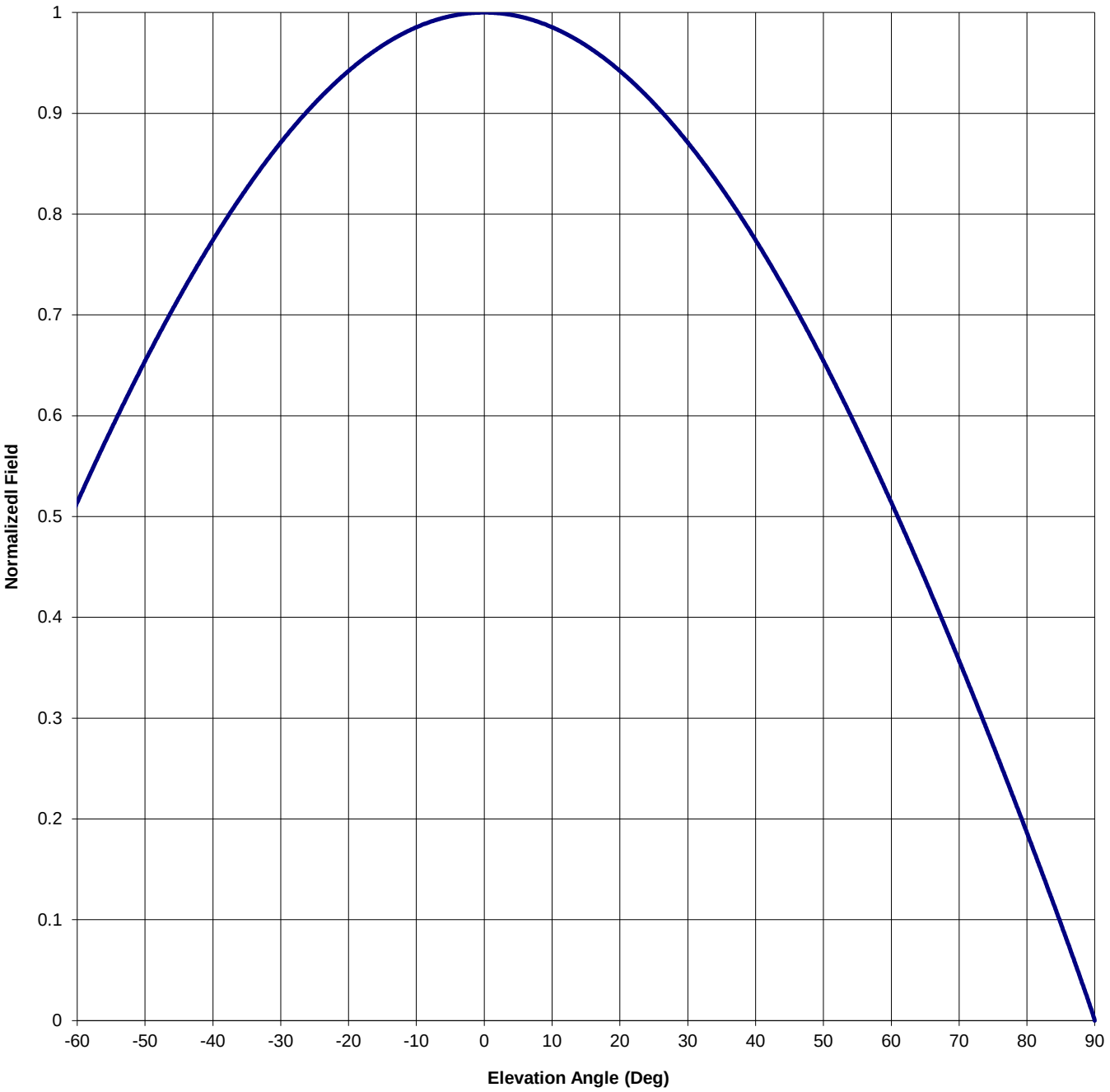
TOP VIEW

TOWER MAKE:
180' WSST TOWER

ANTENNA HEADING 58° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 36766	FREQUENCY: 101.1 MHz	SCALE: N.T.S.	DRAWN BY: JHFF APPROVED BY: ASP
TITLE: MODEL-6810-1R-DIRECTIONAL ANTENNA			
DATE: 9-8-20	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**9/4/2020**
Antenna Type:	**6810-1R-DA**				
Station:	**KSFR**	**Beam Tilt**	**0**		
Frequency:	**101.1**	**Gain (Max)**	**0.779**	**-1.084**	**dB**
Channel #:	**266**	**Gain (Horizon)**	**0.779**	**-1.084**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 9/4/2020

Antenna Type: 6810-1R-DA

Station: KSFR **Beam Tilt** 0

Frequency: 101.1 **Gain (Max)** 0.779 -1.084 dB

Channel #: 266 **Gain (Horizon)** 0.779 -1.084 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		

S.O. 36766 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KSFR WHITE ROCK

MODEL 6810-1R-DA

Elevation Gain of Antenna 0.454

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

H RMS 0.776675 V RMS 0.750363 H/V Ratio 1.035

Elevation Gain of Horizontal Component 0.470

Elevation Gain of Vertical Component 0.439

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.658

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.744

Max. Vertical 0.991

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

Total Horizontal Power Gain = **0.779**

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

Total Vertical Power Gain = **0.765**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

2.9 kW ERP Divided by H Gain 0.779 equals 3.723 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

3.723 kW Times V Gain 0.765 equals 2.848 kW V ERP

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

(0.991)^2 Times 2.90 Equals 2.848 kW Vertical ERP

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