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S.O. 29897

Report of Test 6018-1/6600-1 Special DA

for

Four Rivers Community Broadcasting Corporation

WZXN 90.1 MHz Newburg, PA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6018-1/6600-1 Special DA to meet the needs of WZXN and to comply with the requirements of the FCC construction permit, file number BMPED-20120522AER. 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 BMPED-20120522AER indicates that the Horizontal radiation component shall not exceed 5.6 kW at any azimuth and is restricted to the following values at the azimuths specified:

330 through 340 Degrees T: 0.42 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 80 Degrees T to 86 Degrees T. At the restricted azimuth of 330 through 340 Degrees T the Horizontal component is 11.63 dB down from the maximum of 5.6 kW, or 0.384 kW.

The R.M.S. of the Horizontal component is 0.273. The total Horizontal power gain is 0.756. The R.M.S. of the Vertical component is 0.437. The total Vertical power gain is 3.853. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.553. The R.M.S. of the measured composite pattern is 0.493. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.470. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6018-1/6600-1 Special DA was mounted on a tower of precise scale to the Sabre 3600 tower at the WZXN 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 BMPED-20120522AER, a single level of the 6018-1/6600-1 Special 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 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

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 405.45 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 1A.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 29897
July 2, 2012

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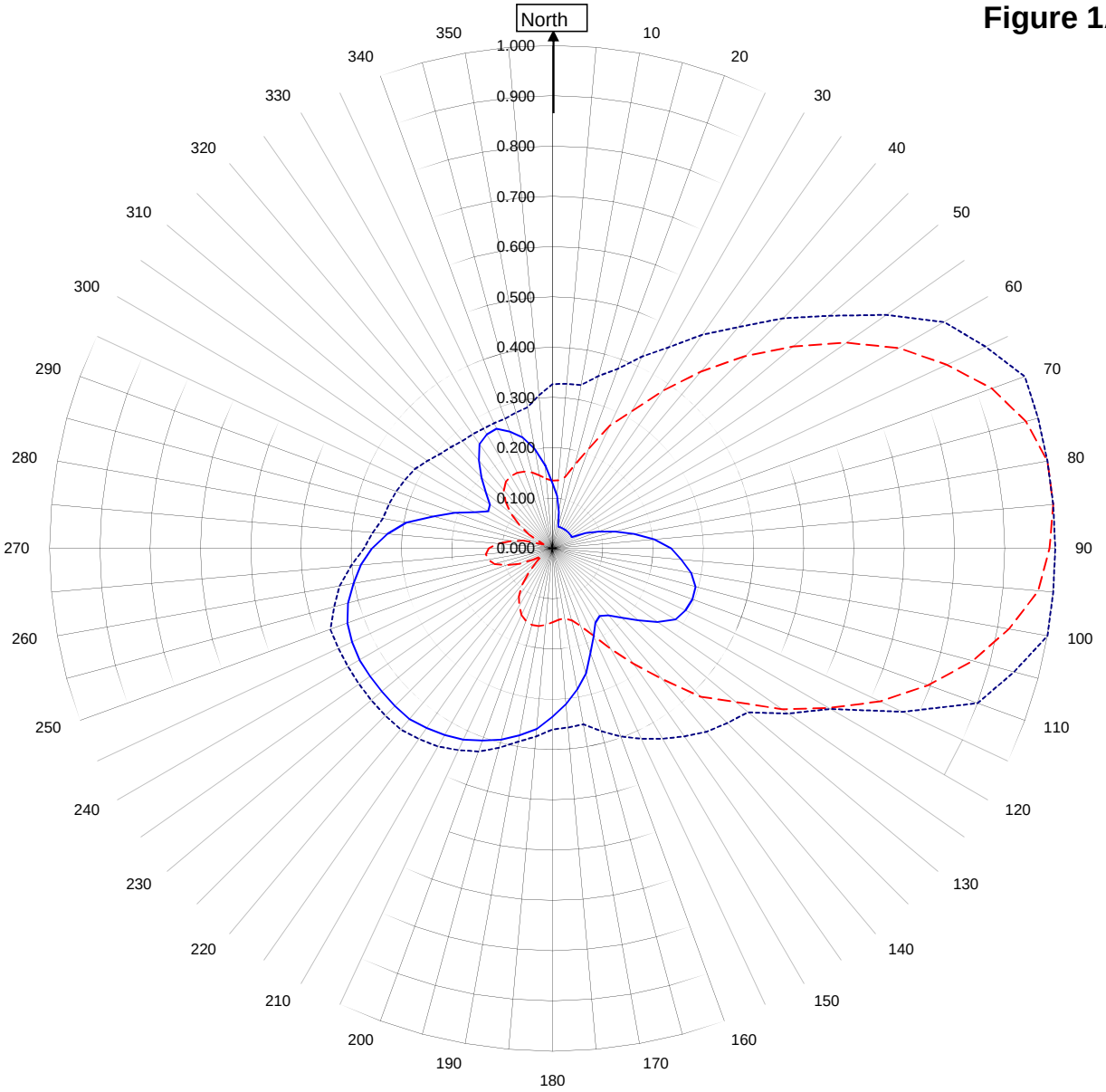
Figure 1A



WZXN NEWBURG, PA.

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July 2, 2012

Horizontal RMS	0.273
Vertical RMS	0.437
H/V Composite RMS	0.493
FCC Composite RMS	0.553

Frequency	90.1 / 405.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6018-1/6600-1 Special DA
Pattern Type	Directional Azimuth

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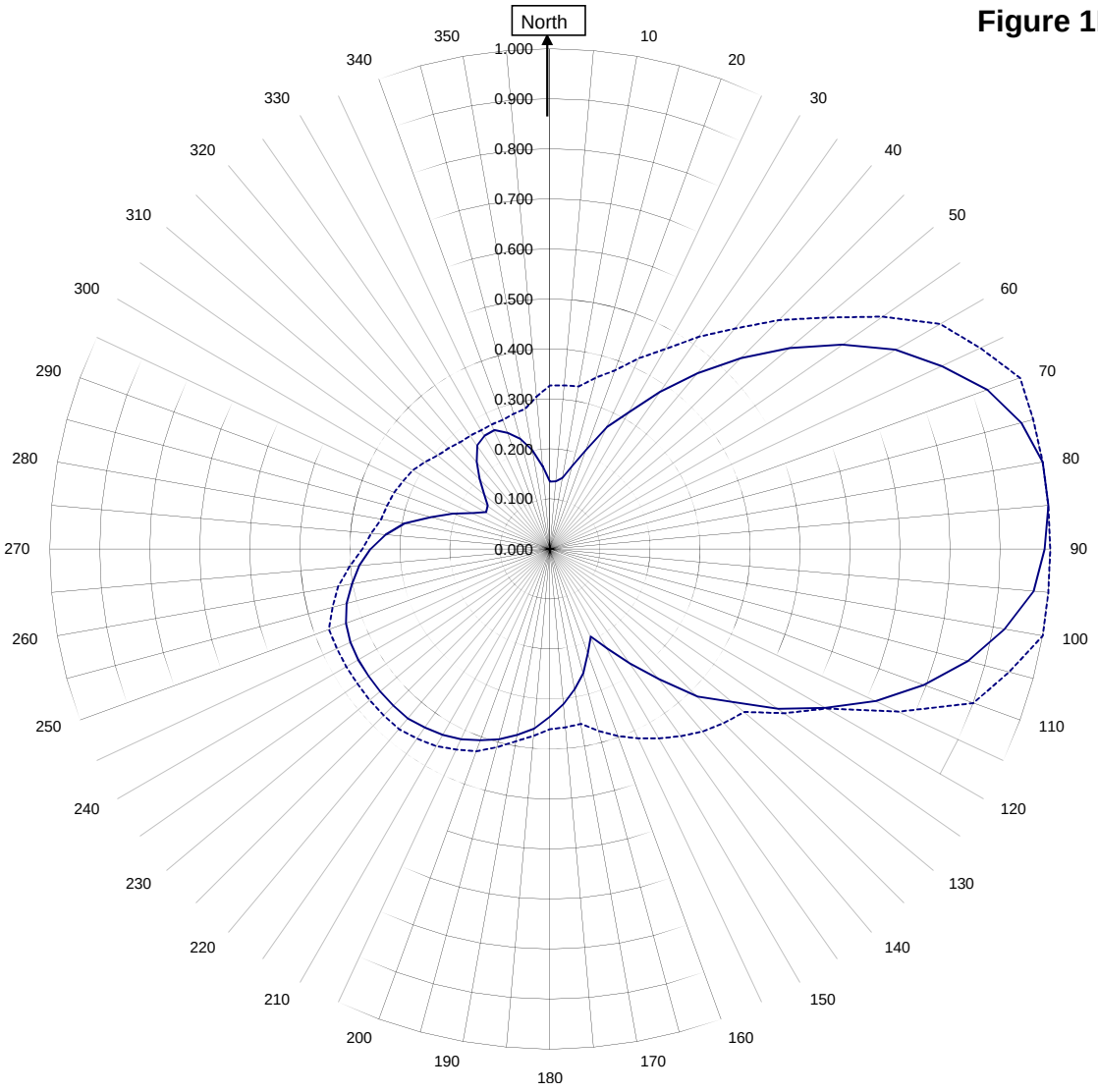
Figure 1B



WZXN NEWBURG, PA.

29897

July 2, 2012

_____H/VComposite RMS	0.493
……FCC Composite RMS	0.553

Frequency	90.1 / 405.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6018-1/6600-1 Special DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WZXN NEWBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.130	180	0.335
10	0.074	190	0.377
20	0.045	200	0.407
30	0.045	210	0.429
40	0.045	220	0.443
45	0.045	225	0.443
50	0.045	230	0.443
60	0.045	240	0.443
70	0.097	250	0.434
80	0.165	260	0.402
90	0.237	270	0.359
100	0.280	280	0.296
110	0.296	290	0.207
120	0.283	300	0.147
130	0.222	310	0.173
135	0.195	315	0.199
140	0.173	320	0.228
150	0.171	330	0.262
160	0.221	340	0.247
170	0.284	350	0.200

Figure 1D

Tabulation of Vertical Azimuth Pattern
WZXN NEWBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.135	180	0.147
10	0.145	190	0.156
20	0.211	200	0.154
30	0.315	210	0.132
40	0.459	220	0.093
45	0.540	225	0.065
50	0.625	230	0.041
60	0.797	240	0.045
70	0.930	250	0.098
80	1.000	260	0.129
90	0.988	270	0.127
100	0.922	280	0.085
110	0.795	290	0.028
120	0.635	300	0.053
130	0.475	310	0.108
135	0.417	315	0.132
140	0.339	320	0.151
150	0.230	330	0.166
160	0.164	340	0.163
170	0.141	350	0.148

Figure 1E

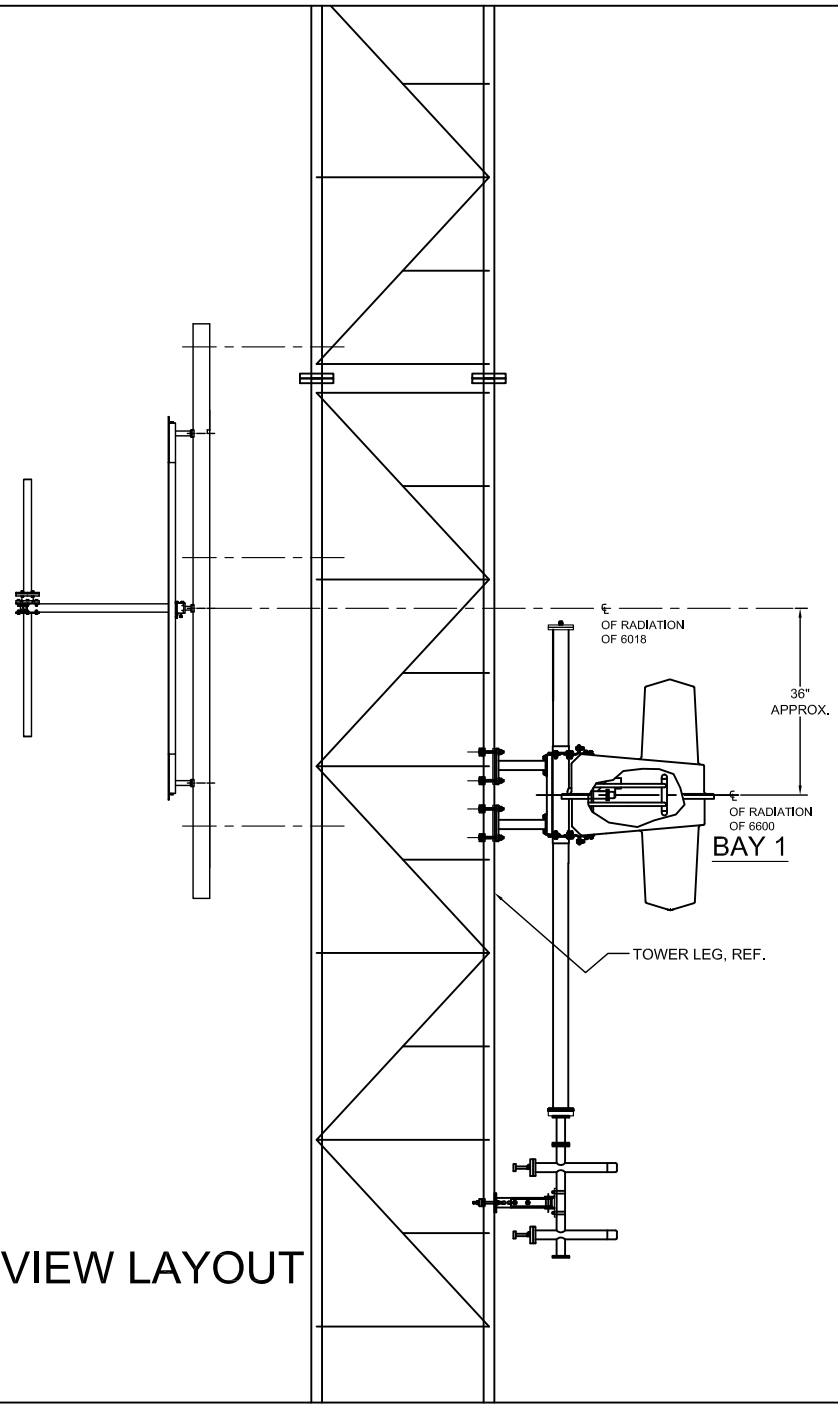
Tabulation of Composite Azimuth Pattern
WZXN NEWBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.135	180	0.335
10	0.145	190	0.377
20	0.211	200	0.407
30	0.315	210	0.429
40	0.459	220	0.443
45	0.540	225	0.443
50	0.625	230	0.443
60	0.797	240	0.443
70	0.930	250	0.434
80	1.000	260	0.402
90	0.988	270	0.359
100	0.922	280	0.296
110	0.795	290	0.207
120	0.635	300	0.147
130	0.475	310	0.173
135	0.417	315	0.199
140	0.339	320	0.228
150	0.230	330	0.262
160	0.221	340	0.247
170	0.284	350	0.200

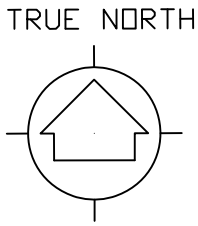
Figure 1F

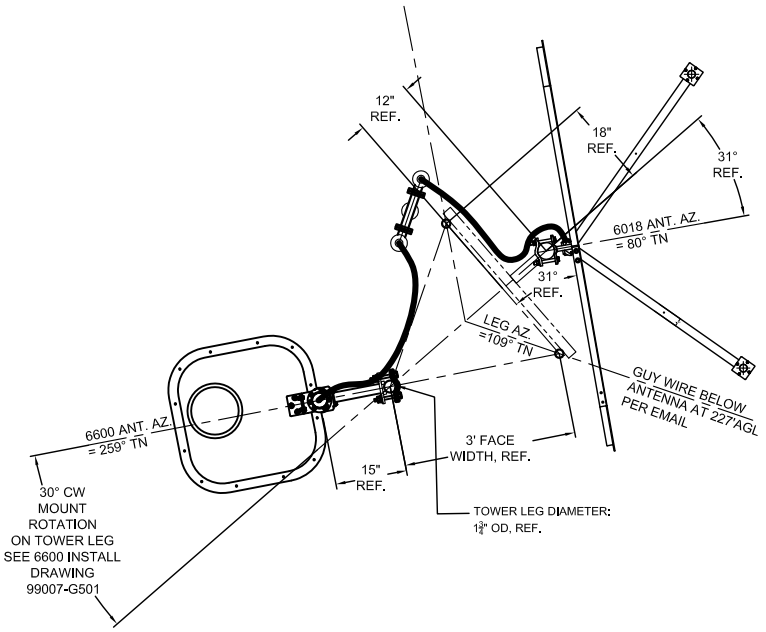
Tabulation of FCC Directional Composite
WZXN NEWBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.327	180	0.360
10	0.330	190	0.390
20	0.380	200	0.430
30	0.462	210	0.455
40	0.575	220	0.470
50	0.720	230	0.470
60	0.900	240	0.470
70	1.000	250	0.470
80	1.000	260	0.430
90	1.000	270	0.375
100	1.000	280	0.343
110	0.900	290	0.331
120	0.638	300	0.316
130	0.507	310	0.292
140	0.476	320	0.279
150	0.437	330	0.275
160	0.398	340	0.275
170	0.355	350	0.285



SIDE VIEW LAYOUT





TOP VIEW LAYOUT
TOWER MAKE: SABRE 3600

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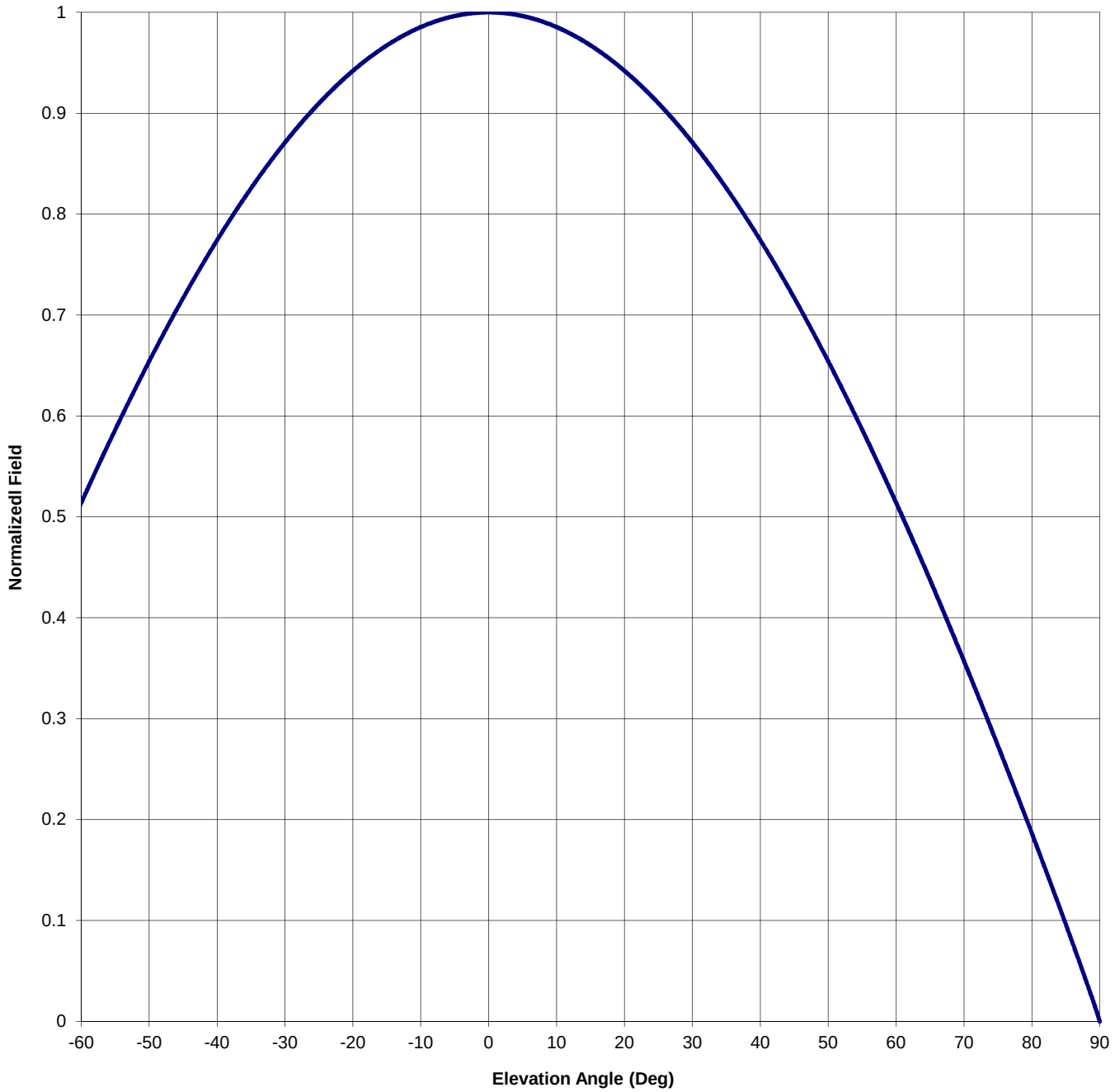
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
29897	90.1 MHz	N.T.S.	DAB
			APPROVED BY: ASP

TITLE:
MODEL-6018V-1/1 6600-1RDIRECTIONAL ANTENNA
DIRECTIONAL ANTENNA

DATE: 7-3-12

FIGURE 2

Antenna Mfg.:	**Shively Labs**				**Date: 7/2/2012**
Antenna Type:	**6018-1/6600-1 Spec DA**				
Station:	**WZXN**	**Beam Tilt**	**0**		
Frequency:	**90.1**	**Gain (Max)**	**3.853**	**5.858 dB**	
Channel #:	**211**	**Gain (Horizon)**	**3.853**	**5.858 dB**	
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 7/2/2012

Antenna Type: 6018-1/6600-1 Spec DA

Station: WZXN **Beam Tilt** 0

Frequency: 90.1 **Gain (Max)** 3.853 5.858 dB

Channel #: 211 **Gain (Horizon)** 3.853 5.858 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		

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VALIDATION OF TOTAL POWER GAIN CALCULATION

WZXN NEWBURG, PA.

MODEL 6018-1/6600-1 Special DA

Elevation Gain of Antenna 0.46

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

V RMS 0.436686 H RMS 0.273359 H/V Ratio 1.597

Elevation Gain of Vertical Component 0.735

Elevation Gain of Horizontal Component 0.288

Vertical Azimuth Gain equals $1/(RMS)^2$. 5.244

Horizontal Azimuth Gain equals $1/(RMS/Max\ Horiz)^2$. 2.626

Max. Horizontal 0.443

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

Total Vertical Power Gain = **3.853**

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

Total Horizontal Power Gain = **0.756**

==========

ERP divided by Vertical Power Gain equals Antenna Input Power

5.6 kW ERP Divided by V Gain 3.853 equals 1.453 kW V Antenna Input Power

Antenna Input Power times Horizontal Power Gain equals Horizontal ERP

1.453 kW Times H Gain 0.756 equals 1.099 kW H ERP

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

(0.443)^2 Times 5.60 Equals 1.099 kW Horizontal ERP

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