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S.O. 31119

Report of Test Scala YA7H/6020-1V-DA

for

Four Rivers community Broadcasting corporation

WEVW 90.9 MHz Elysburg, PA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Scala YA7H/6020-1V-DA to meet the needs of WEVW and to comply with the requirements of the FCC construction permit, file number BMPED-20130626AAA. 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-20130626AAA indicates that the Horizontal radiation component shall not exceed 0.230 kW at any azimuth and is restricted to the following values at the azimuths specified:

60 - 80 Degrees True: 0.0073 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 60 - 80 Degrees True the Vertical component is 15.650 dB down from the maximum of 0.230 kW, or 0.0063 kW.

The R.M.S. of the Horizontal component is 0.406. The total Horizontal power gain is 6.992. The R.M.S. of the Vertical component is 0.238. The total Vertical power gain is 1.515. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.506. The R.M.S. of the measured composite pattern is 0.449. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.430. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Scala YA7H/6020-1V-DA was mounted on a tower of precise scale to the 36" tower at the WEVW 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-20130626AAA, a single level of the Scala YA7H/6020-1V-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 409.05 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 31119
October 2, 2013

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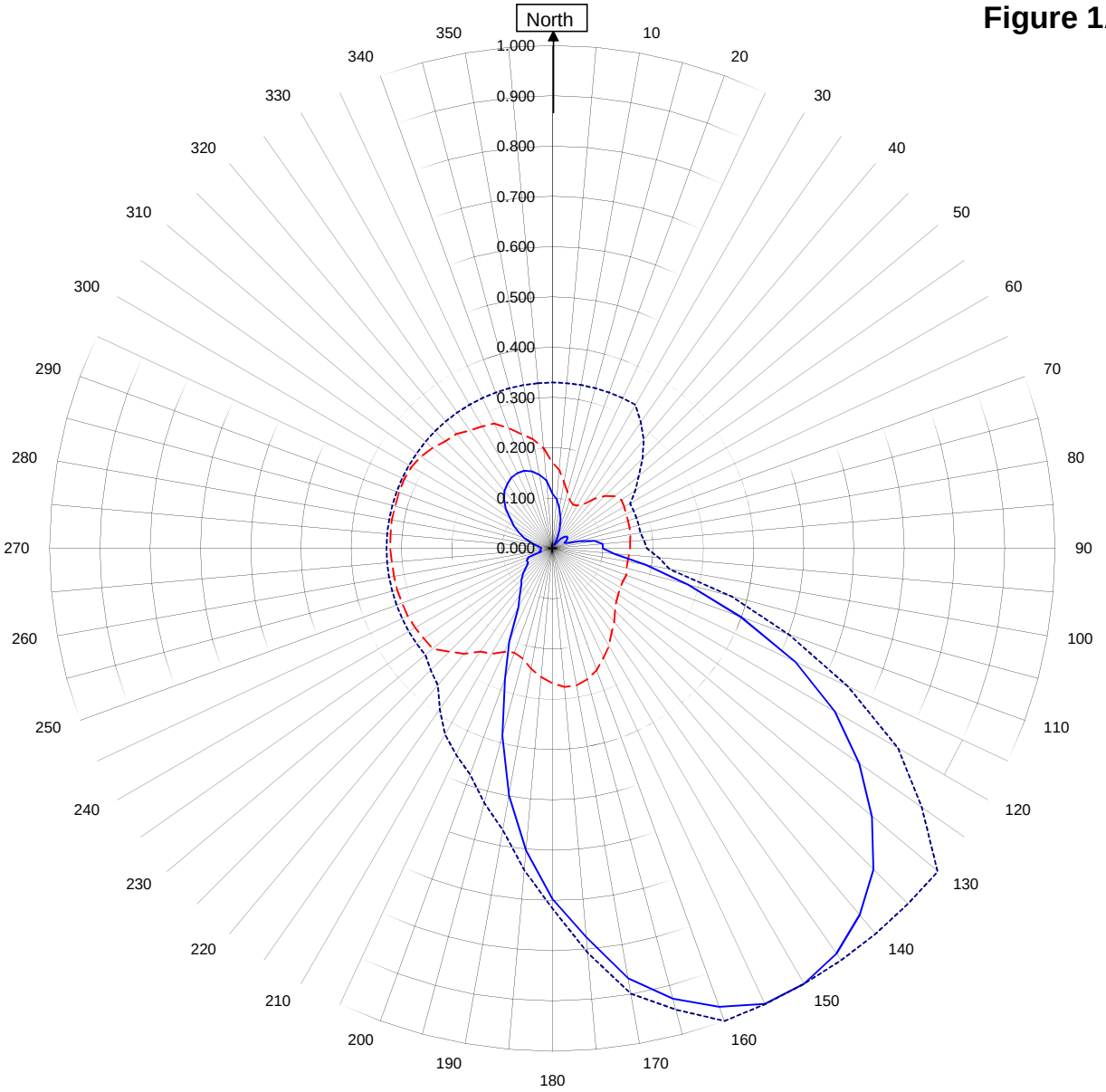
Figure 1A



WEVW ELYSBURG, PA.

31119

October 1, 2013

Horizontal RMS	0.406
Vertical RMS	0.238
H/V Composite RMS	0.449
FCC Composite RMS	0.506

Frequency	90.9 / 409.05 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	SCALA YA7H/6020-1V-DA
Pattern Type	Directional Azimuth

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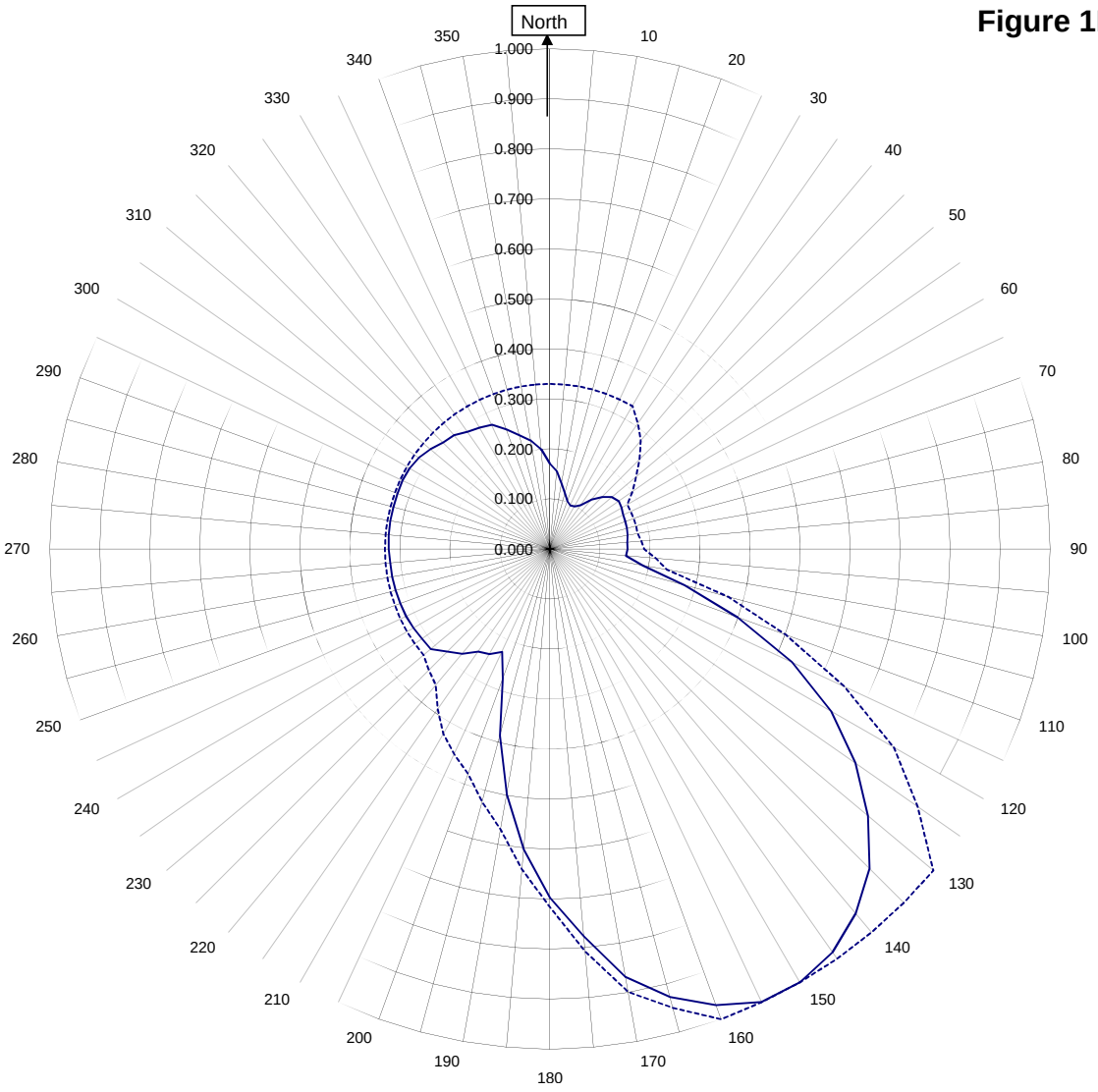
Figure 1B



WEVW ELYSBURG, PA.

31119

October 1, 2013

_____H/VComposite RMS	0.449
……FCC Composite RMS	0.506

Frequency	90.9 / 409.05 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	SCALA YA7H/6020-1V-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WEVW ELYSBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.109	180	0.697
10	0.080	190	0.499
20	0.042	200	0.276
30	0.008	210	0.137
40	0.025	220	0.097
45	0.033	225	0.088
50	0.037	230	0.076
60	0.032	240	0.056
70	0.032	250	0.050
80	0.085	260	0.026
90	0.101	270	0.022
100	0.189	280	0.032
110	0.399	290	0.059
120	0.649	300	0.089
130	0.830	310	0.121
135	0.903	315	0.136
140	0.951	320	0.149
150	1.000	330	0.163
160	0.970	340	0.164
170	0.868	350	0.149

Figure 1D

Tabulation of Vertical Azimuth Pattern
WEVW ELYSBURG, PA.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.171	180	0.268
10	0.133	190	0.243
20	0.102	200	0.221
30	0.099	210	0.242
40	0.129	220	0.274
45	0.148	225	0.290
50	0.162	230	0.311
60	0.165	240	0.315
70	0.160	250	0.319
80	0.158	260	0.320
90	0.155	270	0.323
100	0.152	280	0.325
110	0.156	290	0.325
120	0.156	300	0.324
130	0.166	310	0.311
135	0.176	315	0.302
140	0.191	320	0.298
150	0.225	330	0.280
160	0.258	340	0.254
170	0.276	350	0.220

Figure 1E

Tabulation of Composite Azimuth Pattern
WEVW ELYSBURG, PA.

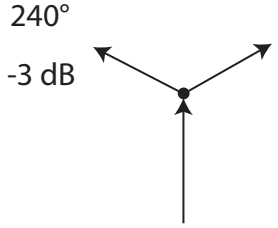
Azimuth	Rel Field	Azimuth	Rel Field
0	0.171	180	0.697
10	0.133	190	0.499
20	0.102	200	0.276
30	0.099	210	0.242
40	0.129	220	0.274
45	0.148	225	0.290
50	0.162	230	0.311
60	0.165	240	0.315
70	0.160	250	0.319
80	0.158	260	0.320
90	0.155	270	0.323
100	0.189	280	0.325
110	0.399	290	0.325
120	0.649	300	0.324
130	0.830	310	0.311
135	0.903	315	0.302
140	0.951	320	0.298
150	1.000	330	0.280
160	0.970	340	0.254
170	0.868	350	0.220

Figure 1F

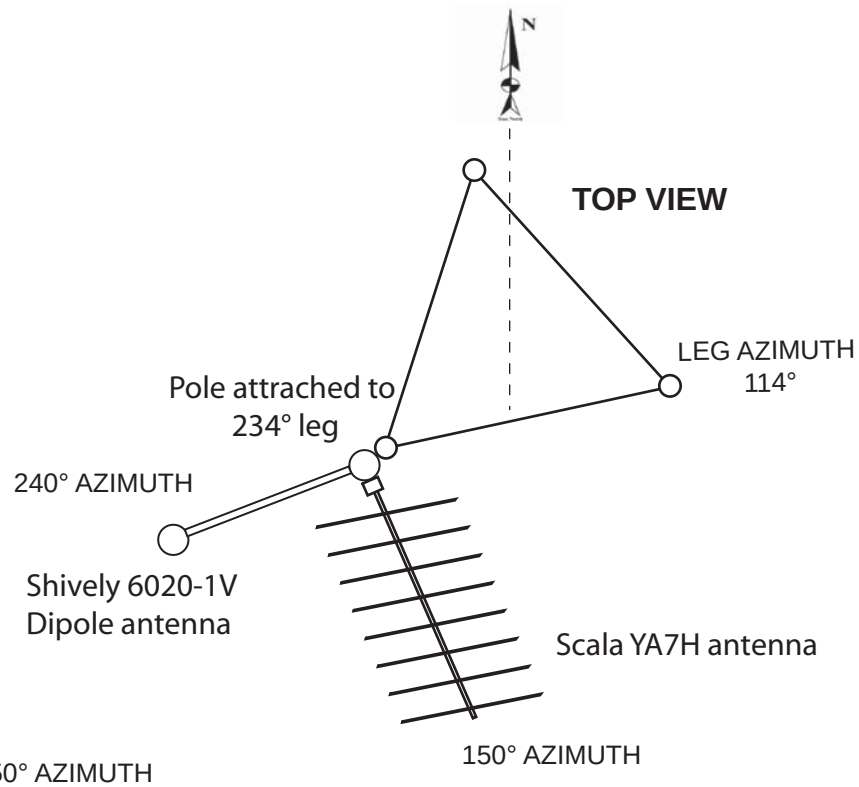
Tabulation of FCC Directional Composite
WEVW ELYSBURG, PA.

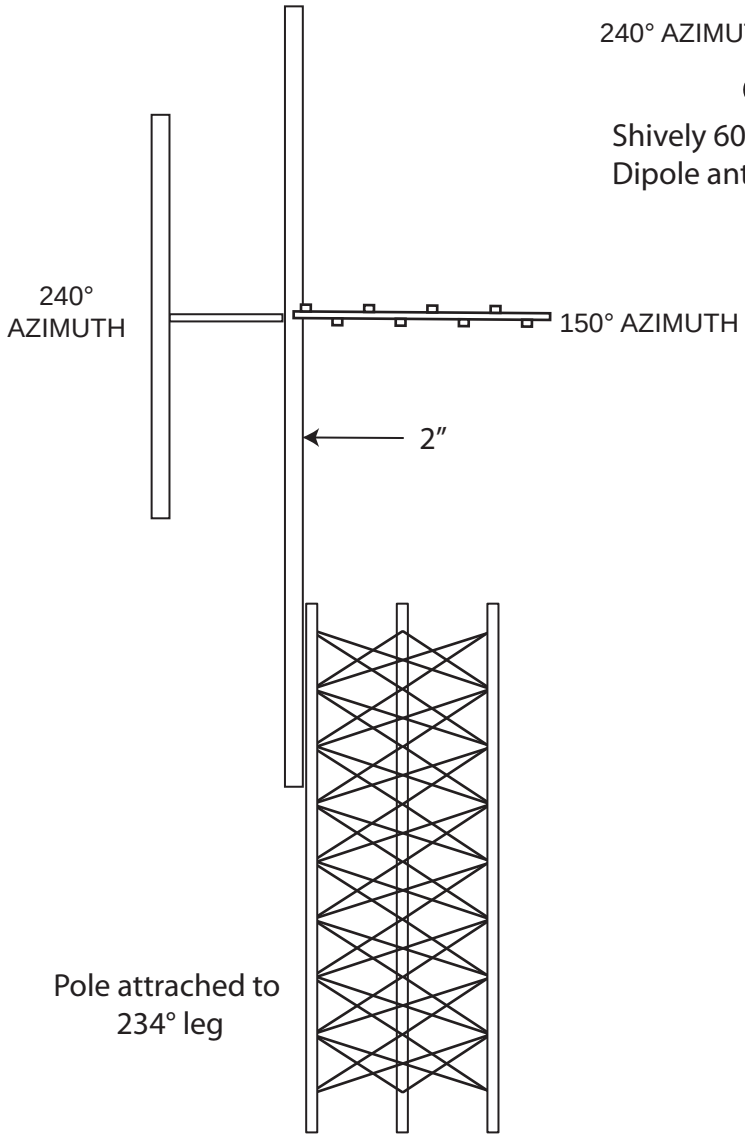
Azimuth	Rel Field	Azimuth	Rel Field
0	0.330	180	0.716
10	0.330	190	0.569
20	0.330	200	0.479
30	0.330	210	0.427
40	0.282	220	0.355
50	0.224	230	0.330
60	0.178	240	0.330
70	0.178	250	0.330
80	0.178	260	0.330
90	0.188	270	0.330
100	0.237	280	0.330
110	0.501	290	0.330
120	0.794	300	0.330
130	1.000	310	0.330
140	1.000	320	0.330
150	1.000	330	0.330
160	1.000	340	0.330
170	0.899	350	0.330

COAX SYSTEM
ANTENNA 150° FULL POWER
ANTENNA 234° -3 dB POWER
EQUAL PHASE

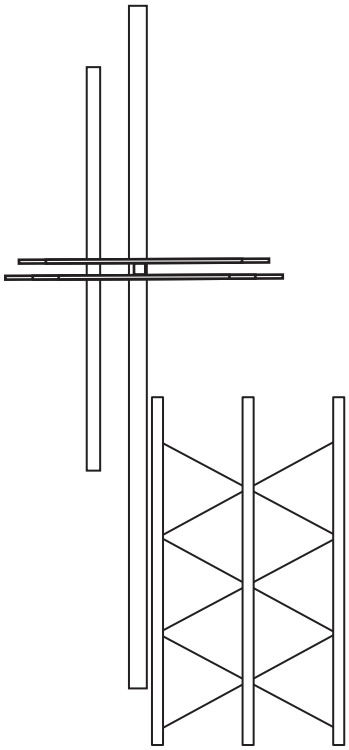


SCHEMATIC VIEW





ELEVATION VIEW



PARTIAL FRONT VIEW

SHIVELY LABS

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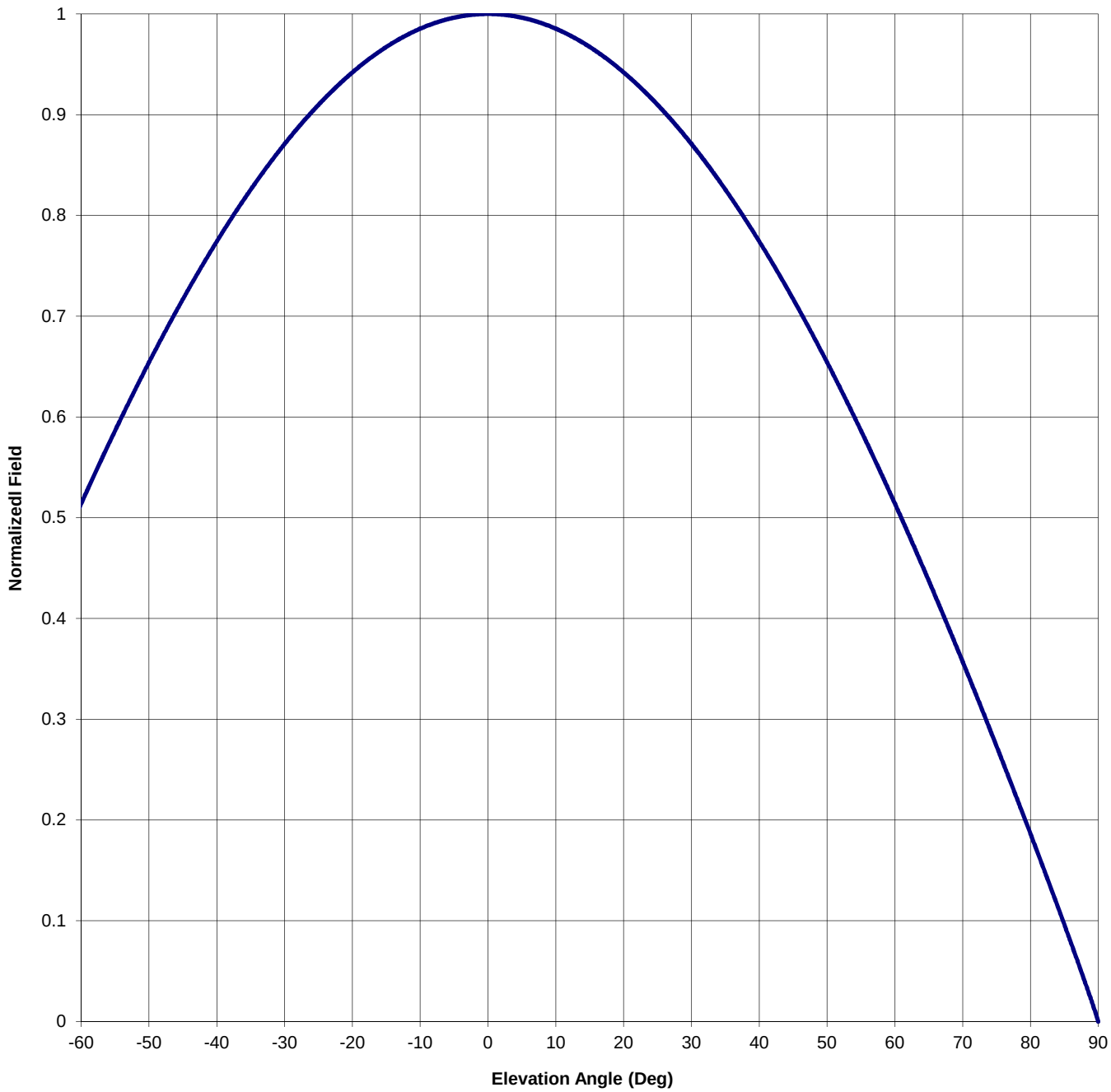
FIGURE 2, WEVW 90.9 MHz
Scala YA7H/6020-1V-DA

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	RAS1012013	—

SCALE		SHEET
NONE	S/O 31119	1 OF 1

Antenna Mfg.:	**Shively Labs**			**Date:**	**10/2/2013**
Antenna Type:	**Scala YA7H/6020-1V-DA**				
Station:	**WEVW**	**Beam Tilt**	**0**		
Frequency:	**90.9**	**Gain (Max)**	**6.992**	**8.446**	**dB**
Channel #:	**215**	**Gain (Horizon)**	**6.992**	**8.446**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 10/2/2013

Antenna Type: Scala YA7H/6020-1V-DA

Station: WEVW **Beam Tilt** 0

Frequency: 90.9 **Gain (Max)** 6.992 8.446 dB

Channel #: 215 **Gain (Horizon)** 6.992 8.446 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. 31119 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WEVW Elysburg, PA

SCALA YA7H/6020-1V-DA

Elevation Gain of Antenna 1.15

H RMS 0.40556

Horizontal Azimuth Gain equals $1/(RMS)^2$ 6.080

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

Total Horizontal Power Gain **6.992**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.230	kW ERP	Divided by H Gain	6.992	Equals	**0.033**	kW Horizontal Input Power
0.0250	kW ERP	Divided by V Gain	1.515	Equals	0.0165	kW Vertical unput Power

With a power divider feeding full power to the H antenna and -3 dB to the V antenna,
With a feed system loss is 0.5 dB, the total Antenna input power is **0.0555** kW