Shively Labs
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S.O. 26271

Report of Test Scala YA7 1/2 Yagi

for

AMERICAN EDUCATIONAL BROADCASTING, INC.

KLKA 88.5 MHz Globe, AZ

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Scala YA7 1/2 Yagi to meet the needs of KLKA and to comply with the requirements of the FCC construction permit, file number BMPED-20071218ACW.

RESULTS:

The measured azimuth pattern for the Scala YA7 1/2 Yagi is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. Figure 1B shows the Tabulation of the FCC Composite Pattern. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20071218ACW indicates that the Vertical radiation component shall not exceed 1.5 kW at any azimuth and is restricted to the following values at the azimuths specified:

0-140 and 310-350 Degrees T: 0.048 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 224 Degrees T to 226 Degrees T. At the restricted azimuth of 0-140 and 310-350 Degrees T the Vertical component is 20 dB down from the maximum of 1.5 kW, or 0.015 kW.

The R.M.S. of the Vertical component is 0.368. The total Vertical power gain is 8.122. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.425. The R.M.S. of the measured composite pattern is 0.368. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.361. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The Scala YA7 1/2 Yagi antenna was mounted on a tower of precise scale to the Microflect square tapered tower at the KLKA site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20071218ACW, a single level of the Scala YA7 1/2 Yagi was set up on the Howell Laboratories 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

The test equipment is calibrated to ANSI/NCSL Z540-1-1994.

TEST PROCEDURES:

The corner reflector is mounted so that the horizontal and vertical azimuth patterns are measured independently by rotating the corner reflector by 90 degrees. The network analyzer was set to 398.25 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 1.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 26271
January 16, 2008

Shively Labs

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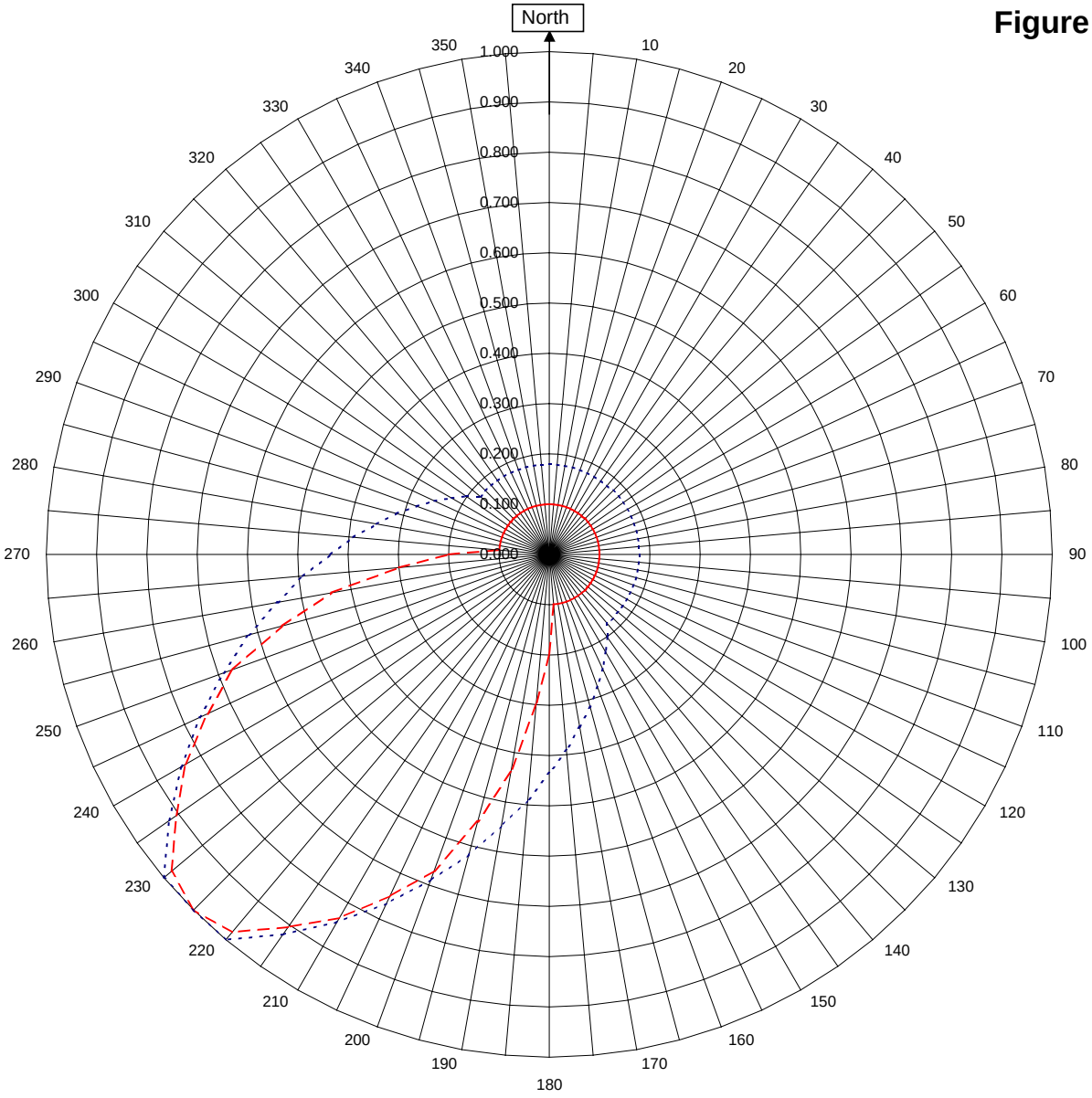
Figure 1



KLKA Globe, AZ

26271

January 16, 2008

Horizontal RMS	0.000
Vertical RMS	0.368
H/V Composite RMS	0.368
FCC Composite RMS	0.425

Frequency	88.5 / 398.25 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Scala YA7 1/2 Yagi Pattern 02-A
Pattern Type	Directional Azimuth

Figure 1A

Tabulation of Vertical Azimuth Pattern
KLKA Globe, AZ

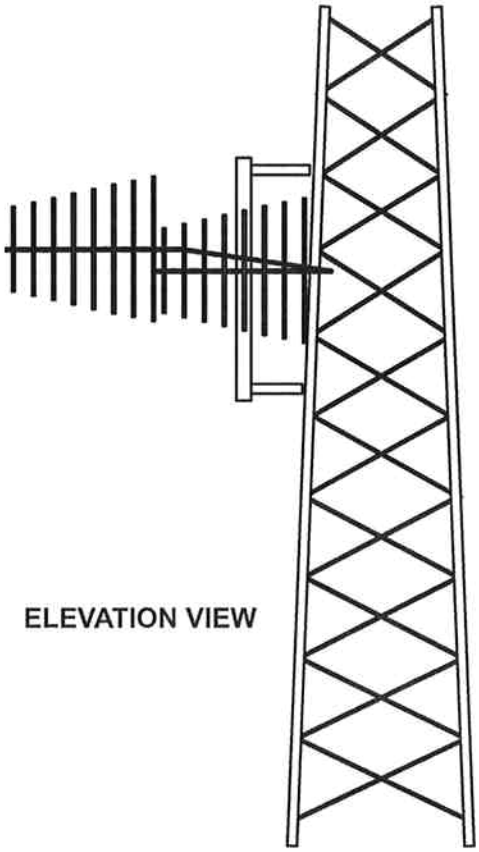
Azimuth	Rel Field	Azimuth	Rel Field
0	0.100	180	0.200
10	0.100	190	0.440
20	0.100	200	0.670
30	0.100	210	0.835
40	0.100	220	0.980
45	0.100	225	1.000
50	0.100	230	0.980
60	0.100	240	0.835
70	0.100	250	0.670
80	0.100	260	0.440
90	0.100	270	0.200
100	0.100	280	0.100
110	0.100	290	0.100
120	0.100	300	0.100
130	0.100	310	0.100
135	0.100	315	0.100
140	0.100	320	0.100
150	0.100	330	0.100
160	0.100	340	0.100
170	0.100	350	0.100

Figure 1B

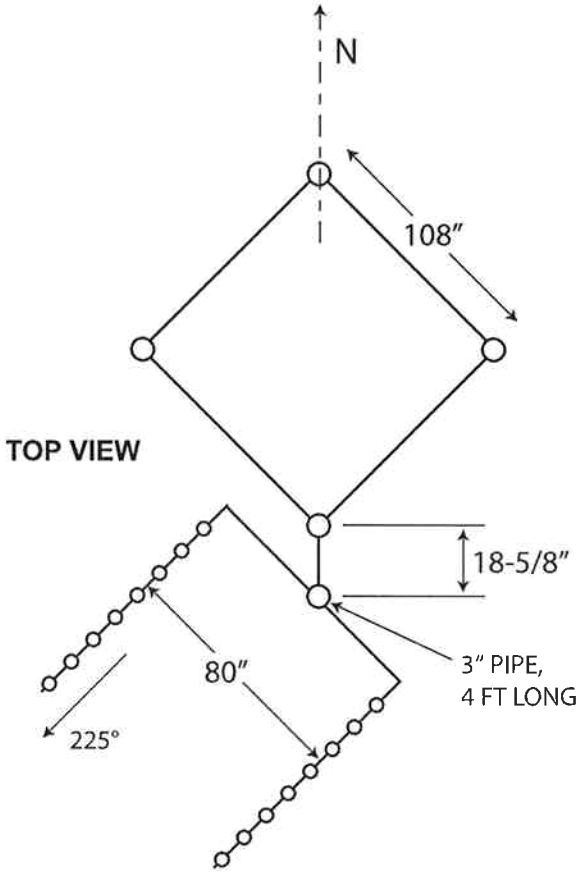
Tabulation of FCC Directional Composite
KLKA Globe, AZ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.179	180	0.435
10	0.179	190	0.548
20	0.179	200	0.689
30	0.179	210	0.845
40	0.179	220	1.000
50	0.179	230	1.000
60	0.179	240	0.845
70	0.179	250	0.689
80	0.179	260	0.548
90	0.179	270	0.435
100	0.179	280	0.348
110	0.179	290	0.280
120	0.179	300	0.224
130	0.179	310	0.179
140	0.179	320	0.179
150	0.224	330	0.179
160	0.280	340	0.179
170	0.348	350	0.179

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	18-5/8" was 17".	1/16/08	



ELEVATION VIEW



PART NO.

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
TOLERANCES UNLESS OTHERWISE SPECIFIED:
FRACTIONAL: ± 1/32
ANGLES: ± 1/2
2 PL DECIMAL: ± .02
3 PL DECIMAL: ± .005
SURFACE FINISH 63
FILLETS .015 MAX

ANGLE PROJECTION

MATERIAL

	APPROVED BY	DATE
MFG. APPROVAL		
ENG. APPROVAL		
CHECKED		
DRAWN BY		

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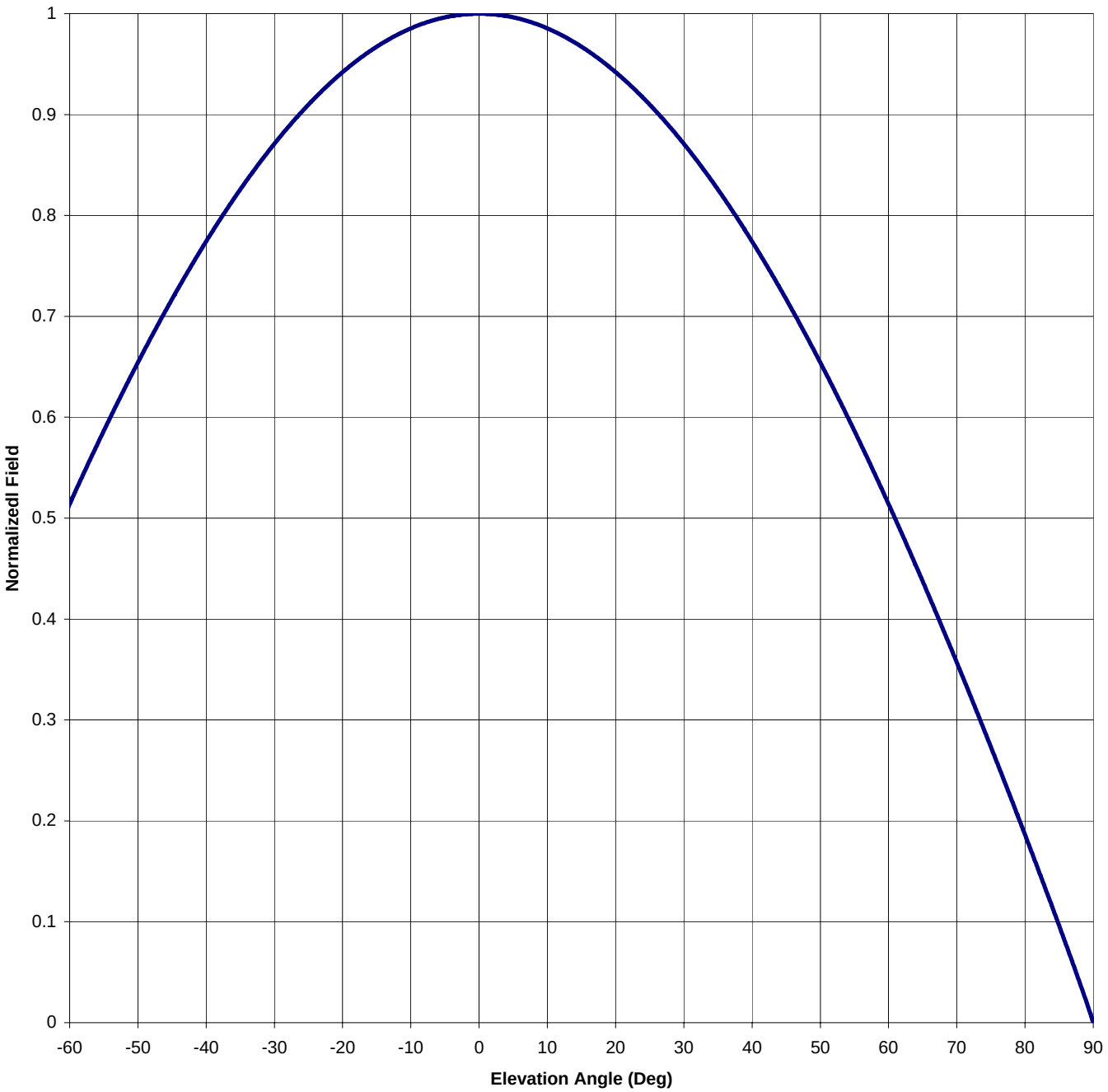
BRIDGTON, MAINE USA

Figure 2
KLKA Scala YA7 1/2 Yagi

SIZE	CAGE CODE	DWG NO	REV
A	26750	AGF071220-001	A

SCALE		SHEET
NONE	26271 88.5 MHz	1 OF 1

Antenna Mfg.:	**Shively Labs**			**Date: 1/16/2008**
Antenna Type:	**Scala YA7 1/2 Yagi**			
Station:	**KLKA**	**Beam Tilt**	**0**	
Frequency:	**88.5**	**Gain (Max)**	**8.122**	**9.097 dB**
Channel #:	**203**	**Gain (Horizon)**	**8.122**	**9.097 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs
Antenna Type: Scala YA7 1/2 Yagi
Station: KLKA
Frequency: 88.5
Channel #: 203
Figure: 3

Beam Tilt 0
Gain (Max) 8.122
Gain (Horizon) 8.122

Date: 1/16/2008
9.097 dB
9.097 dB

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		

FIGURE 4

S.O. 26271

VALIDATION OF GAIN CALCULATION

KLKA 88.5 MHz GLOBE, AZ

Scala YA7 1/2 Yagi

Elevation Gain of Scala YA7 1/2 Yagi equals 1.1

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.368)^2 = 7.384$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.1 x 7.384 = 8.122

ERP divided by Vertical Gain equals Antenna Input Power
1.5 kW ÷ 8.122 = 0.185 kW