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S.O. 26485

Report of Test Scala CA5-FM/CP/RM-1/1

for

TRI-STATE PUBLIC COMMUNICATIONS, INC.

WHDD-FM 91.9 MHz Sharon, CT

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Scala CA5-FM/CP/RM-1/1 to meet the needs of WHDD-FM and to comply with the requirements of the FCC construction permit, file number BMPED-20080221ABD.

RESULTS:

The measured azimuth pattern for the Scala CA5-FM/CP/RM-1/1 is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. Figure 1C 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-20080221ABD indicates that the Horizontal radiation component shall not exceed 0.650 kW at any azimuth and is restricted to the following values at the azimuths specified:

70 - 120 Degrees T: 0.021 kW

180 - 230 Degrees T: 0.021 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 325 Degrees T to 331 Degrees T. At the restricted azimuth of 70 - 120 Degrees T the Horizontal component is 15.92 dB down from the maximum of 0.650 kW, or 0.017 kW. At the restricted azimuth of 180 - 230 Degrees T the Horizontal component is 15.92 dB down from the maximum of 0.650 kW, or 0.017 kW.

The R.M.S. of the Horizontal component is 0.395. The total Horizontal power gain is 3.313. The R.M.S. of the Vertical component is 0.389. The total Vertical power gain is 2.565. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.489. The R.M.S. of the measured composite pattern is 0.420. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.416. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The Scala CA5-FM/CP/RM-1/1 was mounted on a pole of precise scale to the 3″ pole at the WHDD-FM site. The spacing of the antenna to the pole was varied to achieve the horizontal and vertical patterns shown in Figure 1. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20080221ABD, a single level of the Scala CA5-FM/CP/RM-1/1 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 413.55 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 26485
April 3, 2008

Shively Labs

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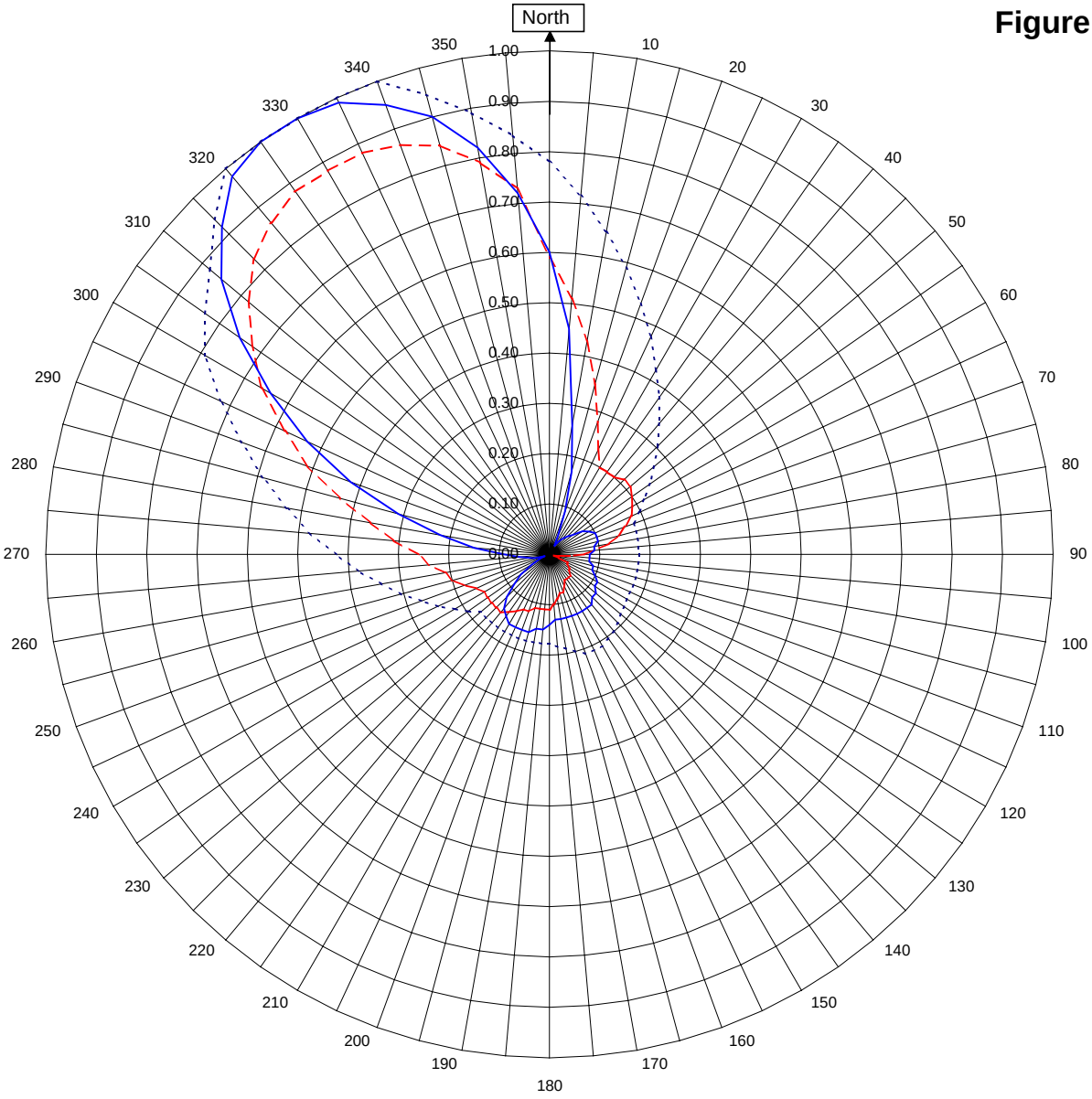
Figure 1



WHDD Sharon CT

26485

April 3, 2008

_____Horizontal RMS	0.395
_ _ _ _ _ _ _ _ _ Vertical RMS	0.389
H/V Composite RMS	0.420
.....FCC Composite RMS	0.489

Frequency	91.9 / 413.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Scala CA5-FM/CP/RM-1/1
Pattern Type	Directional

Figure 1a

Tabulation of Horizontal Azimuth Pattern
WHDD Sharon CT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.600	180	0.140
10	0.260	190	0.150
20	0.090	200	0.160
30	0.020	210	0.160
40	0.040	220	0.140
45	0.050	225	0.120
50	0.060	230	0.090
60	0.090	240	0.040
70	0.100	250	0.010
80	0.090	260	0.040
90	0.080	270	0.090
100	0.080	280	0.220
110	0.090	290	0.420
120	0.110	300	0.640
130	0.120	310	0.850
135	0.120	315	0.920
140	0.130	320	0.980
150	0.130	330	1.000
160	0.130	340	0.950
170	0.130	350	0.820

Figure 1b

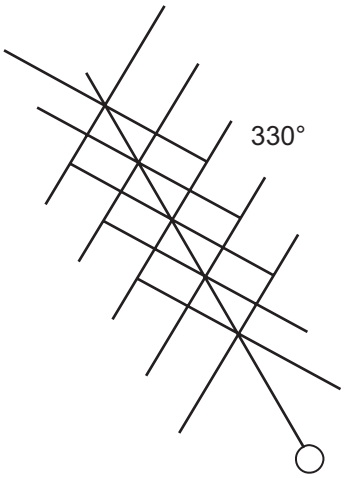
Tabulation of Vertical Azimuth Pattern
WHDD Sharon CT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.590	180	0.110
10	0.430	190	0.110
20	0.280	200	0.120
30	0.200	210	0.130
40	0.200	220	0.150
45	0.210	225	0.150
50	0.210	230	0.150
60	0.190	240	0.150
70	0.160	250	0.180
80	0.120	260	0.210
90	0.070	270	0.260
100	0.020	280	0.360
110	0.020	290	0.510
120	0.040	300	0.660
130	0.050	310	0.780
135	0.060	315	0.830
140	0.060	320	0.860
150	0.060	330	0.880
160	0.080	340	0.865
170	0.090	350	0.790

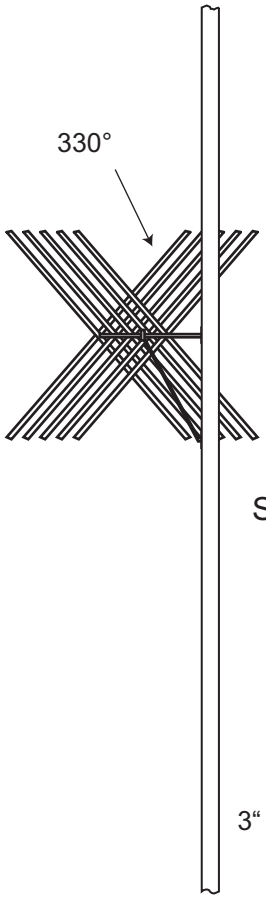
Figure 1c

Tabulation of FCC Directional Composite
WHDD Sharon CT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.780	180	0.178
10	0.650	190	0.178
20	0.530	200	0.178
30	0.423	210	0.178
40	0.339	220	0.178
50	0.271	230	0.178
60	0.217	240	0.217
70	0.178	250	0.271
80	0.178	260	0.339
90	0.178	270	0.423
100	0.178	280	0.530
110	0.178	290	0.650
120	0.178	300	0.790
130	0.185	310	0.880
140	0.200	320	1.000
150	0.210	330	1.000
160	0.210	340	1.000
170	0.190	350	0.890



TOP VIEW



SIDE VIEW

3“ POLE

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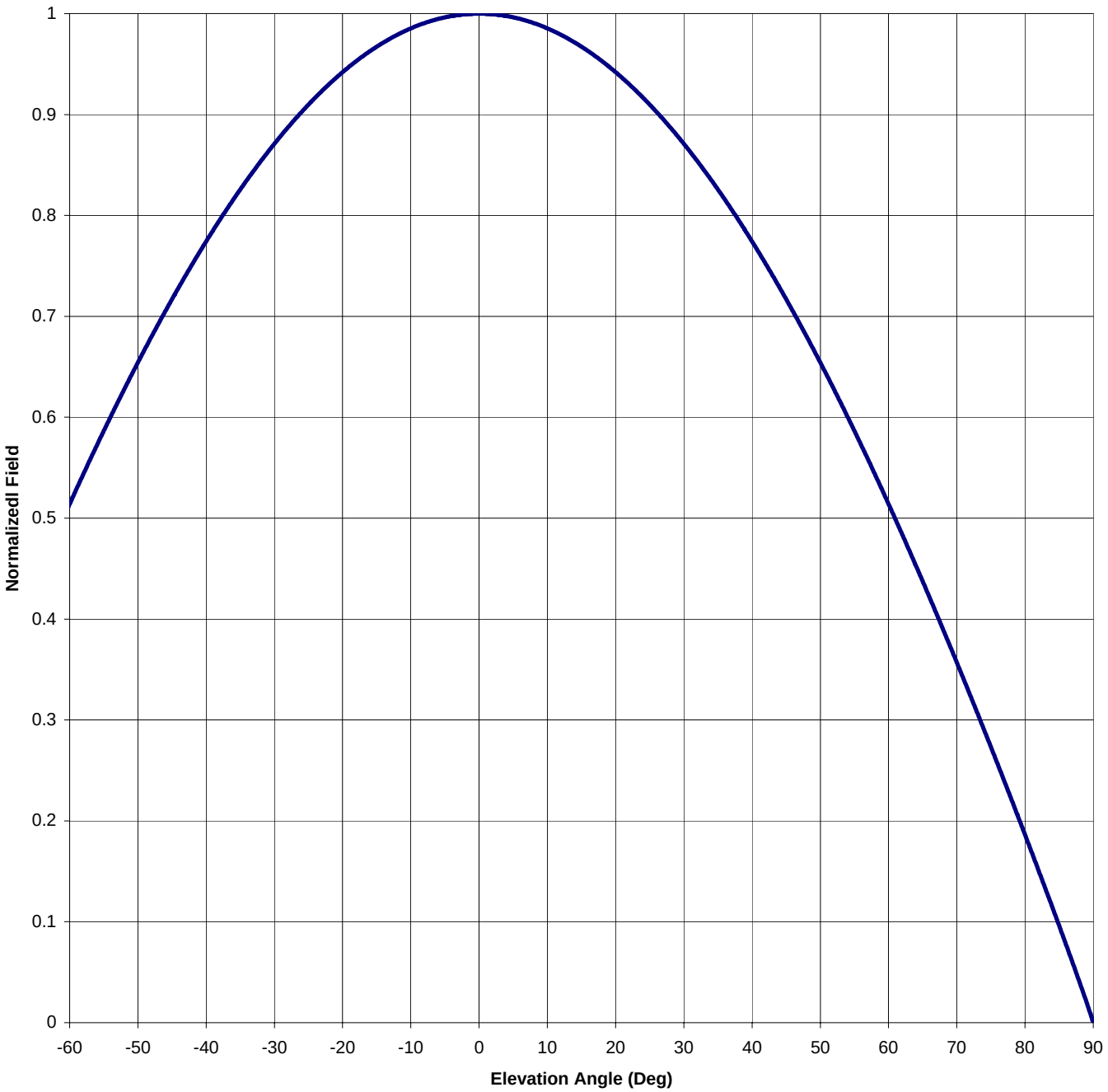
FIGURE 2 WHDD
Scala CA5-FM/CP/RM-1/1

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	AGF080403-001	--

SCALE		SHEET
NONE	S/O 26485	1 OF 1

Antenna Mfg.:	**Shively Labs**			**Date: 4/3/2008**
Antenna Type:	**Scala CA5-FM/CP/RM-1/1**			
Station:	**WHDD-FM**	**Beam Tilt**	**0**	
Frequency:	**91.9**	**Gain (Max)**	**3.313**	**5.203 dB**
Channel #:	**220**	**Gain (Horizon)**	**3.313**	**5.203 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 4/3/2008

Antenna Type: Scala CA5-FM/CP/RM-1/1

Station: WHDD-FM **Beam Tilt** 0

Frequency: 91.9 **Gain (Max)** 3.313 5.203 dB

Channel #: 220 **Gain (Horizon)** 3.313 5.203 dB

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. 26485 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WHDD-FM 91.9 MHz Sharon, CT

Scala CA5-FM/CP/RM-1/1

Elevation Gain of Antenna 0.509

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

H RMS 0.395 V RMS 0.389 H/V Ratio 1.015

Elevation Gain of Horizontal Component 0.517

Elevation Gain of Vertical Component 0.501

Horizontal Azimuth Gain equals $1/(RMS)^2$. 6.409

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 5.118

Max. Vertical 0.88

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

Total Horizontal Power Gain = **3.313**

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

Total Vertical Power Gain = **2.565**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.65 KW ERP Times H Gain 3.313 equals 0.20 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.20 KW Times V Gain 2.565 equals 0.50 kW V ERP

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

(0.88)^2 Times 0.65 Equals 0.50 kW Vertical ERP

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