Shively Labs
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S.O. 24149

Report of Test 6810-5/2-IAD-DA

for

BISHOP OF THE DIOCESE OF ST. PETERSBURG

WBVM 90.5 MHz TAMPA, FL

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-5/2-IAD-DA to meet the needs of WBVM and to comply with the requirements of the FCC construction permit, file number BMPED-20050512ADG, which authorizes a standard analog signal. This report also demonstrates that the interleaved digital antenna also complies with the requirements of this construction permit. The azimuth pattern of the digital antenna is exactly the same as that of the analog. The elevation pattern and gain of the digital antenna are different and are described in Figures 3A and 4A.

RESULTS:

The measured azimuth pattern for the 6810-5/2-IAD-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3 (analog) and Figure 3A (digital). Construction permit file number BMPED-20050512ADG indicates that the Horizontal radiation component shall not exceed 77.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

52 to 90 Degrees T: 1.826 kW

110 Degrees T: 4.216 kW

350 Degrees T: 25.54 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 240 Degrees T to 250 Degrees T. At the restricted azimuth of 52 to 90 Degrees T the Horizontal component is 17.72 dB down from the maximum of 77.0 kW, or 1.301 kW. At the restricted azimuth of 110 Degrees T the Horizontal component is 15.14 dB down from the maximum of 77.0 kW, or 2.358 kW. At the restricted azimuth of 350 Degrees T the Horizontal component is 5.35 dB down from the maximum of 77.0 kW, or 22.453 kW.

THE 5 BAY ANALOG ANTENNA:

The R.M.S. of the Horizontal component is 0.622. The total Horizontal power gain is 7.436. The R.M.S. of the Vertical component is 0.590. The total Vertical power gain is 7.288. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.738. The R.M.S. of the measured composite pattern is 0.662. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.627. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

THE 2 BAY INTERLEAVED IBOC ANTENNA:

The R.M.S. of the Horizontal component is the same as the analog antenna. The total Horizontal power gain is 2.703. The R.M.S. of the Vertical component is the same as the analog antenna. The total Vertical power gain is 2.649. See Figure 4A for calculations. As stated before, the azimuth pattern of the digital antenna is identical to the azimuth pattern of the analog antenna. Therefore the digital antenna pattern also complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-5/2-IAD-DA was mounted on a tower of exact scale to a Kline 10 foot face tower at the WBVM site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1. 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 1 was achieved. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20050512ADG, a single level of the 6810-5/2-IAD-DA 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 Edition 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 407.25 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.

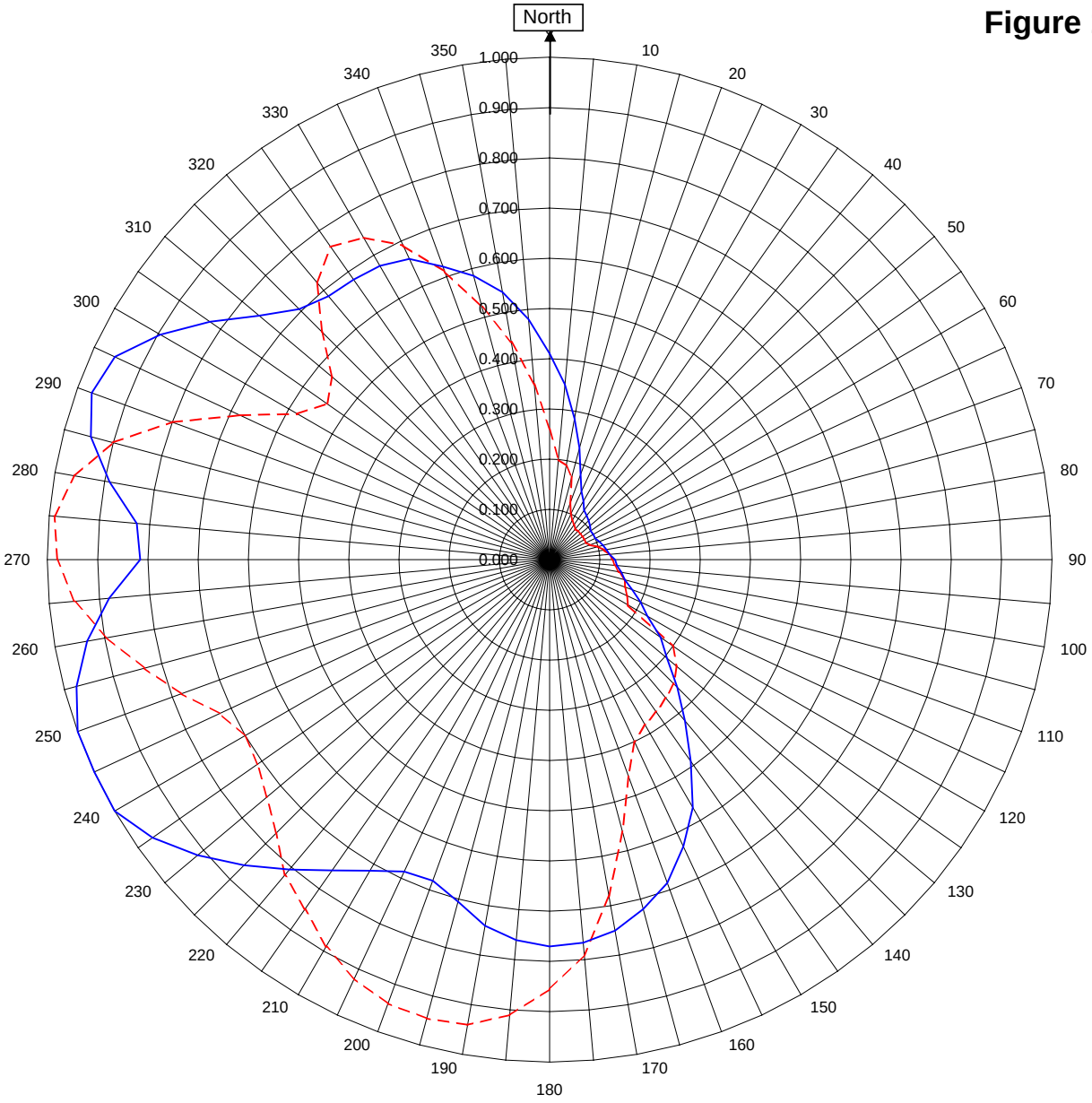
Respectfully submitted by:

Robert A. Surette
Manager of RF Engineering
S/O 24149
August 12, 2005

Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1



WBVM TAMPA, FL

24149

August 8, 2005

Horizontal RMS	0.622
Vertical RMS	0.590
H/V Composite RMS	0.662

Frequency	90.5 / 407.25 mHz
Plot	Relative Field
Scale	4.5 : 1

Antenna Model	6810-5/2-IAD-DA
Pattern Type	Directional Azimuth

See Figure 2 for Mechanical Details

Figure 1a

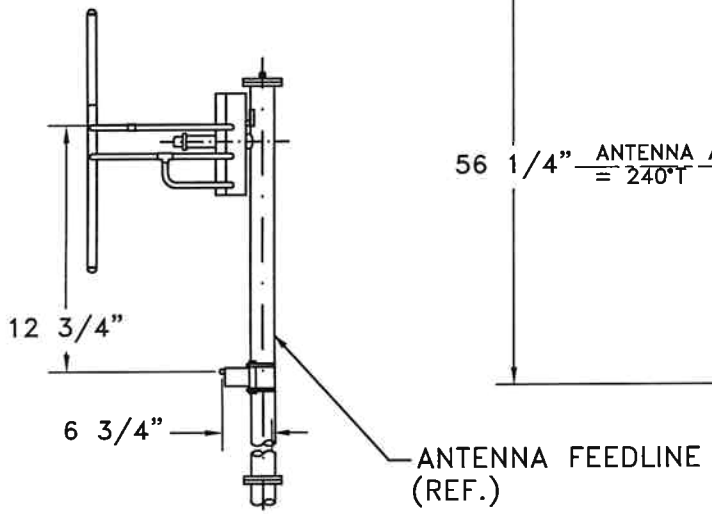
Tabulation of Horizontal Azimuth Pattern
WBVM TAMPA, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.410	180	0.770
10	0.285	190	0.740
20	0.180	200	0.680
30	0.135	210	0.715
40	0.115	220	0.805
45	0.110	225	0.860
50	0.105	230	0.915
60	0.100	240	1.000
70	0.105	250	1.000
80	0.115	260	0.935
90	0.130	270	0.815
100	0.145	280	0.890
110	0.175	290	0.970
120	0.225	300	0.895
130	0.305	310	0.755
135	0.360	315	0.705
140	0.420	320	0.685
150	0.570	330	0.675
160	0.685	340	0.620
170	0.750	350	0.540

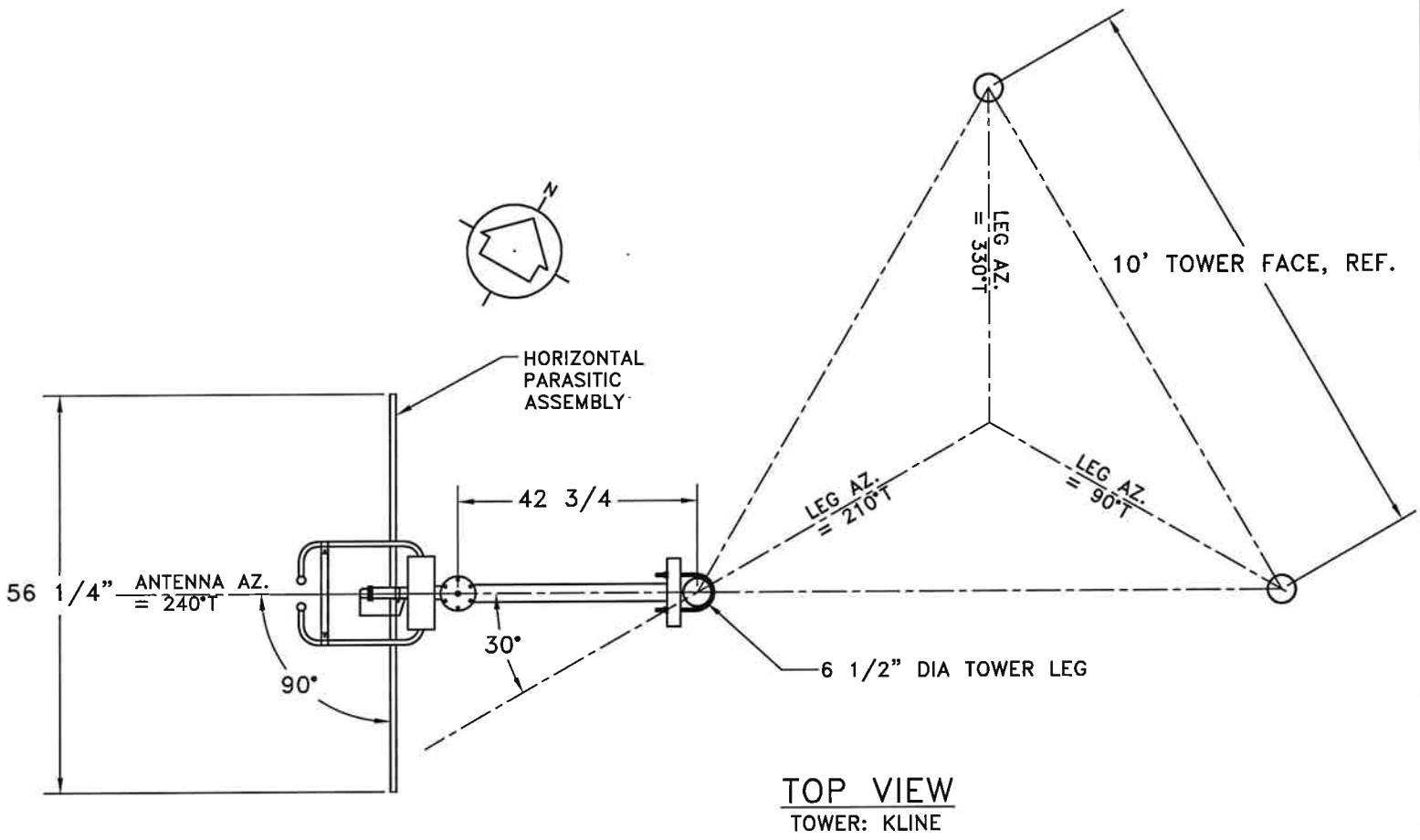
Figure 1b

Tabulation of Vertical Azimuth Pattern
WBVM TAMPA, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.260	180	0.855
10	0.190	190	0.940
20	0.120	200	0.940
30	0.090	210	0.890
40	0.080	220	0.820
45	0.080	225	0.770
50	0.080	230	0.735
60	0.080	240	0.700
70	0.085	250	0.780
80	0.110	260	0.895
90	0.125	270	0.980
100	0.140	280	0.960
110	0.160	290	0.800
120	0.180	300	0.580
130	0.330	310	0.565
135	0.350	315	0.640
140	0.360	320	0.720
150	0.380	330	0.740
160	0.460	340	0.610
170	0.680	350	0.440



SIDE VIEW

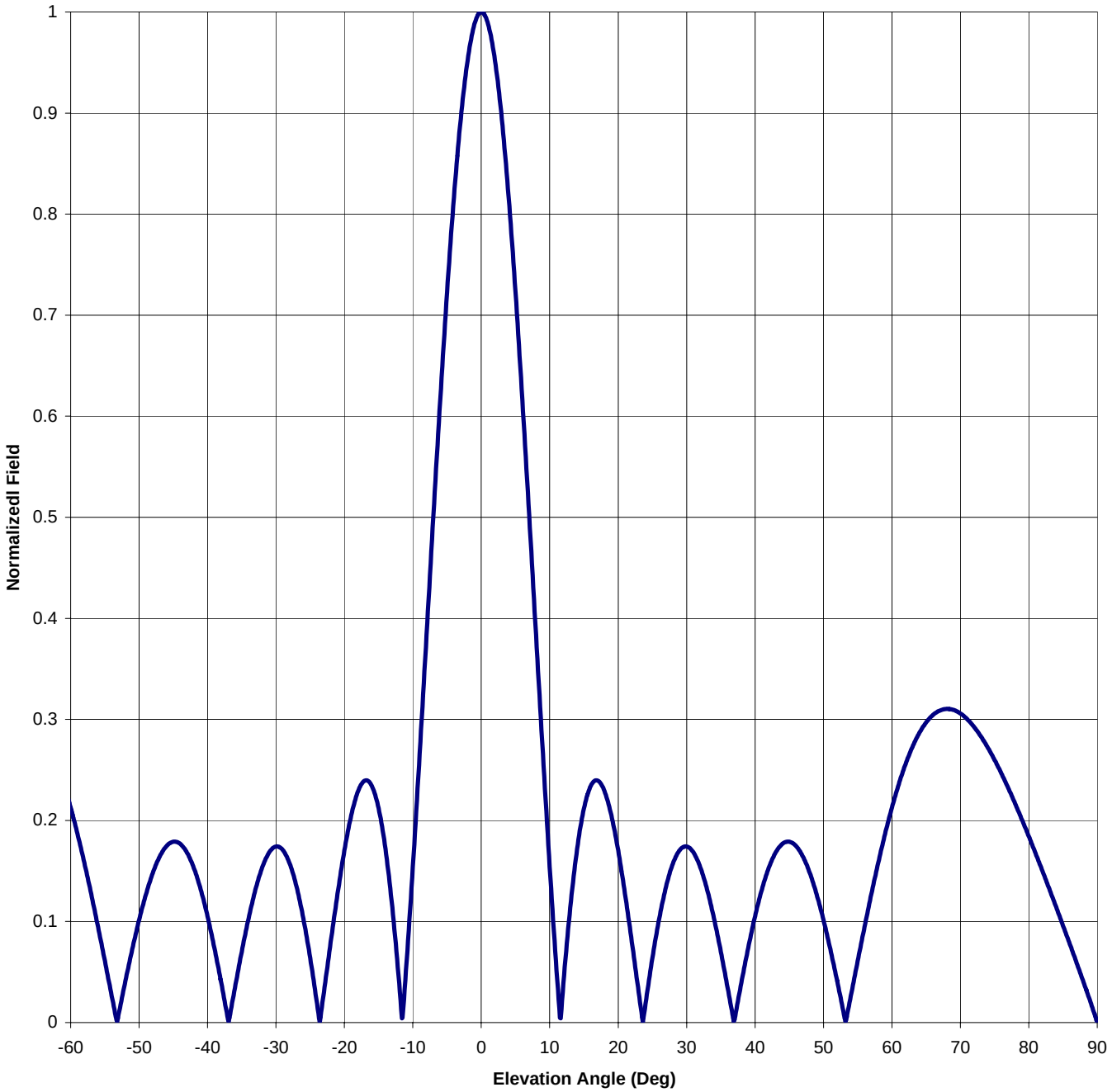


TOP VIEW
TOWER: KLINE

ANTENNA HEADING: 240° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 24149	FREQUENCY: 90.5	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY:
TITLE: MODEL-6810-5/2-IAD-DIRECTIONAL ANTENNA			
DATE: 10/11/05	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**8/8/2005**
Antenna Type:	**6810-5/2-IAD-DA**				
Station:	**WBVM**	**Beam Tilt**	**0**		
Frequency:	**90.5**	**Gain (Max)**	**7.436**	**8.713**	**dB**
Channel #:	**213**	**Gain (Horizon)**	**7.436**	**8.713**	**dB**
Figure:	**3**				



Antenna Mfg.: Shively Labs **Date:** 8/8/2005

Antenna Type: 6810-5/2-IAD-DA

Station: WBVM **Beam Tilt** 0

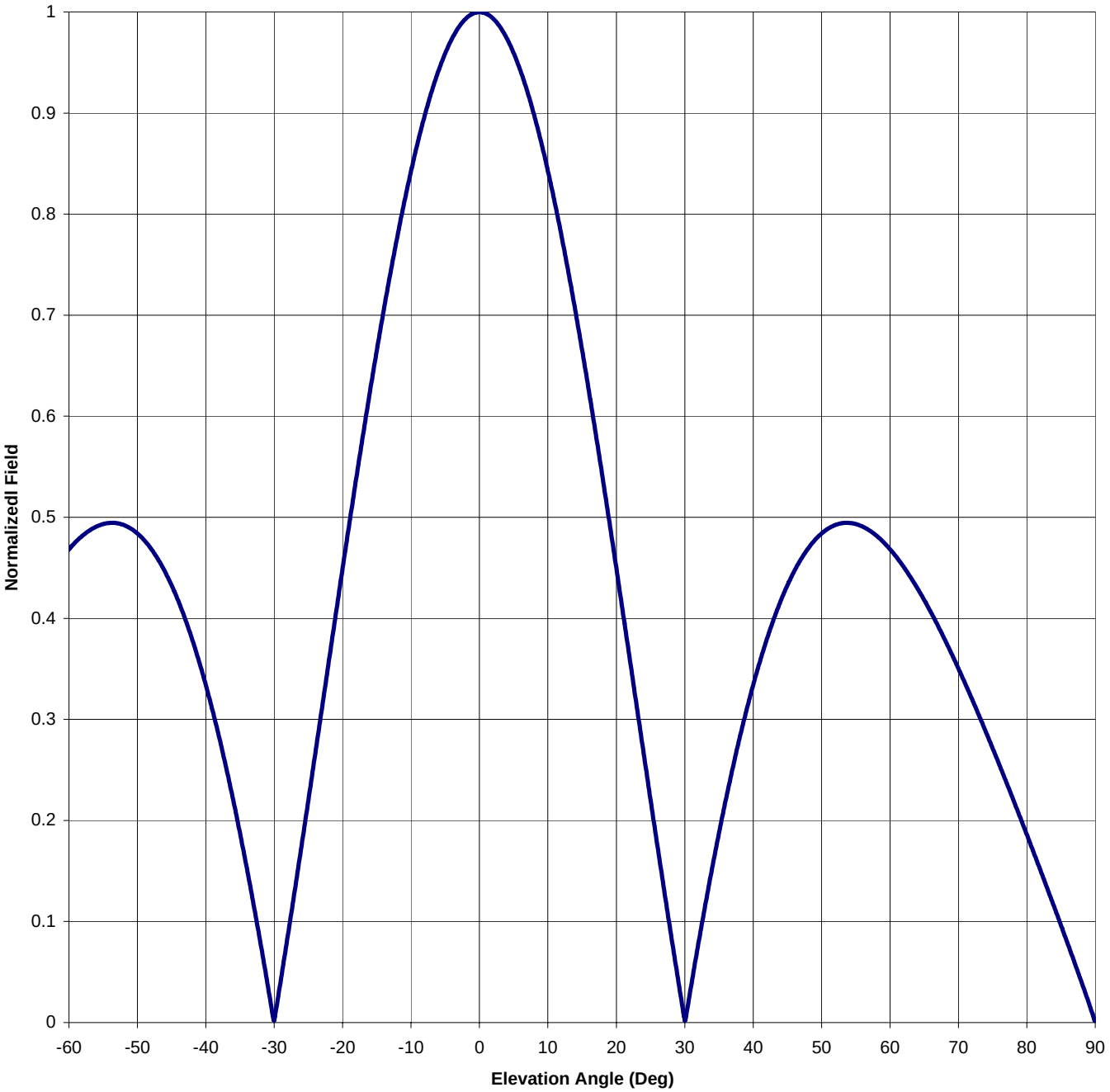
Frequency: 90.5 **Gain (Max)** 7.436 8.713 dB

Channel #: 213 **Gain (Horizon)** 7.436 8.713 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	0.177	0	1.000	46	0.175
-89	0.021	-43	0.168	1	0.988	47	0.164
-88	0.040	-42	0.153	2	0.952	48	0.148
-87	0.059	-41	0.132	3	0.894	49	0.127
-86	0.078	-40	0.105	4	0.817	50	0.101
-85	0.096	-39	0.074	5	0.723	51	0.073
-84	0.114	-38	0.039	6	0.616	52	0.041
-83	0.132	-37	0.003	7	0.502	53	0.008
-82	0.150	-36	0.034	8	0.383	54	0.026
-81	0.167	-35	0.070	9	0.266	55	0.061
-80	0.184	-34	0.103	10	0.154	56	0.095
-79	0.201	-33	0.132	11	0.051	57	0.127
-78	0.217	-32	0.154	12	0.039	58	0.158
-77	0.232	-31	0.168	13	0.114	59	0.187
-76	0.246	-30	0.174	14	0.172	60	0.213
-75	0.260	-29	0.171	15	0.212	61	0.236
-74	0.272	-28	0.157	16	0.234	62	0.256
-73	0.283	-27	0.135	17	0.239	63	0.273
-72	0.293	-26	0.103	18	0.229	64	0.286
-71	0.300	-25	0.064	19	0.205	65	0.297
-70	0.306	-24	0.019	20	0.170	66	0.304
-69	0.309	-23	0.030	21	0.127	67	0.309
-68	0.310	-22	0.080	22	0.080	68	0.310
-67	0.309	-21	0.127	23	0.030	69	0.309
-66	0.304	-20	0.170	24	0.019	70	0.306
-65	0.297	-19	0.205	25	0.064	71	0.300
-64	0.286	-18	0.229	26	0.103	72	0.293
-63	0.273	-17	0.239	27	0.135	73	0.283
-62	0.256	-16	0.234	28	0.157	74	0.272
-61	0.236	-15	0.212	29	0.171	75	0.260
-60	0.213	-14	0.172	30	0.174	76	0.246
-59	0.187	-13	0.114	31	0.168	77	0.232
-58	0.158	-12	0.039	32	0.154	78	0.217
-57	0.127	-11	0.051	33	0.132	79	0.201
-56	0.095	-10	0.154	34	0.103	80	0.184
-55	0.061	-9	0.266	35	0.070	81	0.167
-54	0.026	-8	0.383	36	0.034	82	0.150
-53	0.008	-7	0.502	37	0.003	83	0.132
-52	0.041	-6	0.616	38	0.039	84	0.114
-51	0.073	-5	0.723	39	0.074	85	0.096
-50	0.101	-4	0.817	40	0.105	86	0.078
-49	0.127	-3	0.894	41	0.132	87	0.059
-48	0.148	-2	0.952	42	0.153	88	0.040
-47	0.164	-1	0.988	43	0.168	89	0.021
-46	0.175	0	1.000	44	0.177	90	0.000
-45	0.179			45	0.179		

Antenna Mfg.:	**Shively Labs**			**Date:**	**8/8/2005**
Antenna Type:	**6810-5/2-IAD-DA**				
Station:	**WBVM**	**Beam Tilt**	**0**		
Frequency:	**90.5**	**Gain (Max)**	**2.703**	**4.319**	**dB**
Channel #:	**213**	**Gain (Horizon)**	**2.703**	**4.319**	**dB**
Figure:	**3A**				



Antenna Mfg.: Shively Labs **Date:** 8/8/2005

Antenna Type: 6810-5/2-IAD-DA

Station: WBVM **Beam Tilt** 0

Frequency: 90.5 **Gain (Max)** 2.703 4.319 dB

Channel #: 213 **Gain (Horizon)** 2.703 4.319 dB

Figure: 3A

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	0.417	0	1.000	46	0.447
-89	0.021	-43	0.399	1	0.998	47	0.459
-88	0.040	-42	0.379	2	0.993	48	0.469
-87	0.059	-41	0.358	3	0.985	49	0.477
-86	0.078	-40	0.334	4	0.974	50	0.484
-85	0.096	-39	0.308	5	0.959	51	0.489
-84	0.114	-38	0.281	6	0.942	52	0.492
-83	0.133	-37	0.252	7	0.921	53	0.494
-82	0.151	-36	0.220	8	0.898	54	0.494
-81	0.168	-35	0.187	9	0.872	55	0.493
-80	0.186	-34	0.153	10	0.843	56	0.491
-79	0.203	-33	0.116	11	0.812	57	0.487
-78	0.221	-32	0.078	12	0.778	58	0.482
-77	0.238	-31	0.039	13	0.742	59	0.476
-76	0.255	-30	0.002	14	0.705	60	0.468
-75	0.272	-29	0.044	15	0.665	61	0.460
-74	0.288	-28	0.087	16	0.625	62	0.451
-73	0.304	-27	0.131	17	0.582	63	0.441
-72	0.320	-26	0.175	18	0.539	64	0.430
-71	0.335	-25	0.221	19	0.495	65	0.418
-70	0.350	-24	0.266	20	0.450	66	0.406
-69	0.365	-23	0.312	21	0.404	67	0.393
-68	0.379	-22	0.358	22	0.358	68	0.379
-67	0.393	-21	0.404	23	0.312	69	0.365
-66	0.406	-20	0.450	24	0.266	70	0.350
-65	0.418	-19	0.495	25	0.221	71	0.335
-64	0.430	-18	0.539	26	0.175	72	0.320
-63	0.441	-17	0.582	27	0.131	73	0.304
-62	0.451	-16	0.625	28	0.087	74	0.288
-61	0.460	-15	0.665	29	0.044	75	0.272
-60	0.468	-14	0.705	30	0.002	76	0.255
-59	0.476	-13	0.742	31	0.039	77	0.238
-58	0.482	-12	0.778	32	0.078	78	0.221
-57	0.487	-11	0.812	33	0.116	79	0.203
-56	0.491	-10	0.843	34	0.153	80	0.186
-55	0.493	-9	0.872	35	0.187	81	0.168
-54	0.494	-8	0.898	36	0.220	82	0.151
-53	0.494	-7	0.921	37	0.252	83	0.133
-52	0.492	-6	0.942	38	0.281	84	0.114
-51	0.489	-5	0.959	39	0.308	85	0.096
-50	0.484	-4	0.974	40	0.334	86	0.078
-49	0.477	-3	0.985	41	0.358	87	0.059
-48	0.469	-2	0.993	42	0.379	88	0.040
-47	0.459	-1	0.998	43	0.399	89	0.021
-46	0.447	0	1.000	44	0.417	90	0.000
-45	0.433			45	0.433		

S.O. 24149 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WBVM Tampa, FL

6810-5/2-IA-DA

Elevation Gain of Antenna 2.729

The RMS values are calculated utilizing the data of a planimeter

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

H RMS 0.622 V RMS 0.59 H/V Ratio 1.054

Elevation Gain of Horizontal Component 2.877

Elevation Gain of Vertical Component 2.589

Horizontal Azimuth Gain equals 1/(RMS)SQ. 2.585

Vertical Azimuth Gain equals 1/(RMS/Max Vert)SQ. 2.816
Max. Vertical 0.99

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

Total Horizontal Power Gain = **7.436**

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

Total Vertical Power Gain = **7.288**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

77 KW ERP Equals 10.355 KW Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

10.355 KW Times 7.288 KW Equals 75.468 KW ERP

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

0.99 Equals 75.468 KW Vertical ERP

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

S.O. 24149 Figure 4A

VALIDATION OF TOTAL POWER GAIN CALCULATION

WBVM Tampa, FL

6810-5/2-IAD-DA

Elevation Gain of Antenna 0.992

The RMS values are calculated utilizing the data of a planimeter

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

H RMS 0.622 V RMS 0.59 H/V Ratio 1.054

Elevation Gain of Horizontal Component 1.046

Elevation Gain of Vertical Component 0.941

Horizontal Azimuth Gain equals 1/(RMS)SQ. 2.585

Vertical Azimuth Gain equals 1/(RMS/Max Vert)SQ. 2.816
Max. Vertical 0.99

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

Total Horizontal Power Gain = **2.703**

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

Total Vertical Power Gain = **2.649**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.77 KW ERP Equals 0.285 KW Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.285 KW Times 2.649 KW Equals 0.755 KW ERP

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

0.99 Equals 0.755 KW Vertical ERP

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

R. M. SMITH ASSOCIATES
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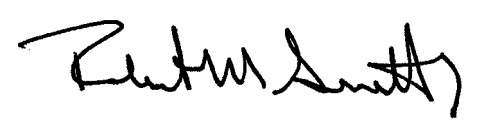
(772) 335-0688 FAX (772) 335-1438
E-MAIL Rmsradio@adelphia.net

November 1, 2005

This is to certify that I personally assisted with the installation of the WBVM(FM), Shively directional antenna and inspected the completed installation. The antenna is assembled and installed in the manner specified in the manufacturer's instructions.

I, Robert M. Smith Jr., of Port St. Lucie, FL, certify that I am a qualified broadcast engineer with over 30 years experience in the field and that I am the proprietor of R. M. Smith Associates of Jensen Beach, FL. My qualifications are a matter of record with the Federal Communications Commission.



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Robert M. Smith Jr.

HEIDT &
ASSOCIATES, INC.

CIVIL ENGINEERING

SURVEYING

ENVIRONMENTAL PERMITTING

PLANNING

LANDSCAPE ARCHITECTURE

60th ANNIVERSARY

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November 1, 2005

Mr. Robert M. Smith Jr.
R.M. Smith Associates
4267 NW Federal Highway #120
Jensen Beach, FL 34957

Dear Mr. Smith:

Re: WBVM (FM) Tampa FL – Antenna Installation

This letter is to confirm that we observed the installation of the WBVM(FM) directional antenna and found that it is aimed at 240 degrees true (plus or minu one degree) as per the manufacturer's instructions.

Heidt & Associates, Inc.

Paul A. Dolcemascolo
Florida Professional Surveyor & Mapper No. 3881