Kessler and Gehman Associates
Consultants • Broadcast • Wireless

APPLICATION FOR LICENSE TO COVER A CONSTRUCTION PERMITTED NON-COMMERCIAL FM BROADCAST STATION

CALL SIGN: WMBR(FM)
FACILITY ID: 64683
FCC FILE NO.: 0000092534
LOCATION: CAMBRIDGE, MA

Prepared For:

Technology Broadcasting Corporation
C/O WMBR, 3 Ames Street
Cambridge, MA 02142

Prepared By:

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September 30, 2021

1.0 EXECUTIVE SUMMARY

Technology Broadcasting Corporation has a construction permit for a non-commercial Class A FM broadcast station having FCC File No.: 0000092534. The construction permit specifies 7 special operating conditions or restrictions which require affidavits, proof of performances, certifications, or other documentation to satisfy the requirements for a license to cover application. The purpose of the instant technical statement is to address the special operating conditions with supporting material and appendices.

2.0 SPECIAL OPERATING CONDITIONS OR RESTRICTIONS

The following special operating conditions and restrictions are requested on the construction permit.

- **The permittee/licensee must, upon completion of construction and during the equipment test period, make proper radiofrequency electromagnetic (RF) field strength measurements throughout the transmitter site area, including on the roof and inside the building, to determine if there are any areas that exceed the FCC guidelines for human exposure to RF fields.**

  To satisfy this special operating condition, a transmitter site visit was necessary to test for RF Maximum Permissible Exposure (MPE) compliance with the construction permitted FM transmitter equipment operating pursuant to Section 73.1610. Hence for testing purposes the newly constructed facility was temporarily operated at its construction permitted parameters for testing purposes only.

  Appendix A demonstrates that with WMBR operating at full authorized power, the accessible areas on the building roof are within the MPE limits for general

population/uncontrolled spaces. Signage and access control policies have been implemented to promote consistently reliable compliance with FCC guidelines. The construction permitted facility as demonstrated above complies with the occupational and general population MPE limits set forth in OET Bulletin No. 65.

- **The permittee must submit the results of a complete proof-of-performance to establish the horizontal plane radiation patterns for both the horizontally and vertically polarized radiation components.**

  Appendix B is a complete proof of performance from the antenna manufacturer demonstrating complete compliance pursuant to the technical parameters of the underlying construction permit.

- **The permittee must submit a certification executed by a licensed surveyor showing that the FM directional antenna system has been oriented at the azimuth(s) specified in the directional antenna proof of performance.**

  Appendix C is a signed and sealed affidavit from a surveyor certifying the antenna orientation is within a ±1° tolerance from 292° true north as specified by the antenna manufacturer in Appendix B.

- **The permittee must submit an affidavit that the installation of the directional antenna system was overseen by a qualified engineer.**

  Appendix D is a notarized affidavit from the qualifying engineer who supervised the installation of the WMBR-FM antenna and certifies that it was installed according to the manufacturer's instructions.

- **The permittee must submit an exhibit demonstrating that the measured directional antenna pattern complies with the appropriate community coverage requirements.**

  Appendix E demonstrates that the measured directional antenna pattern provided in Appendix A has a §73.515 60-dbμV/m f(50,50) contour which completely subsumes the population and area of Cambridge, MA which is the WMBR-FM community of license. All contours were generated in accordance with 47 CFR § 73.333 engineering charts utilizing FCC 30 arc second terrain data.

- **The RMS of the composite measured relative field horizontal plane directional antenna pattern must encompass at least 85% of the RMS of the composite relative field horizontal plane directional antenna pattern authorized by this construction permit.**

  Appendix B demonstrates that The RMS of the FCC composite pattern is 0.845. The RMS of the measured composite pattern is 0.806. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.718. Therefore, this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A)

- **The relative field strength of neither the measured horizontally nor vertically polarized radiation component shall exceed at any azimuth the value indicated on the composite radiation pattern authorized by this construction permit. A relative field strength of 1.0 on the composite radiation pattern herein authorized corresponds to the following effective radiated power: 0.640 kilowatt. Principal minima and their associated field strength limits: 130 to 160 degrees True (clockwise): 0.230 kilowatt.**

  Appendix B demonstrates that the composite measured relative field pattern is completely subsumed by the construction permitted enveloping pattern. The maximum radiation of the Horizontal component occurs at 320 through 325 Degrees True with a relative field strength of 1.0 and represents a peak ERP of 0.640 kW. At the restricted azimuth of 130 to 160 Degrees True the Horizontal component is 9.193 dB down from the maximum of 0.640 kW, or 0.077 kW and is thus compliant.

3.0 CERTIFICATION

The foregoing statement and the report regarding the aforementioned engineering work are true and correct to the best of my knowledge. Executed on September 30, 2021

KESSLER AND GEHMAN ASSOCIATES, INC.

Ryan Wilhour
Consulting Engineer

APPENDIX A – Radiofrequency Electromagnetic Field Strength Measurement

Isotrope WIRELESS
Thinking outside the sphere

Certification of Compliance – WMBR RF Emissions 45 Hayward Street, Cambridge

Introduction

On May 18, 2021, Isotrope Principal David Maxson, CBRE, WCP, performed a rooftop survey of the new WMBR antenna site at MIT Building E37, 45 Hayward Street, Cambridge, Massachusetts. WMBR has a construction permit to move to this address with a two-bay half-wavelength-spaced Shively antenna mounted on a 45-foot tower on the mezzanine roof above the building core. There is an approximately 13 ft high elevator penthouse on the mezzanine roof approximately 10 feet from the antenna face of the tower. (see Figure 1) The directional antenna is licensed to emit 640 W ERP.

Main Finding

With WMBR operating at full authorized power, the accessible areas on the building roof are within the MPE limits for general population/uncontrolled spaces. Signage and access control policies will be recommended to promote consistently reliable compliance with FCC guidelines.

Survey Details

Temporarily operating at the full 640 W ERP for the brief duration of the survey, we employed two Narda 8718 meters, one with a conformal 8722B electric field probe and one with a conformal 8732D magnetic field probe, to measure ambient energy on the main roof and the mezzanine roof The elevator roof has no access without extraordinary measures (requiring an extension ladder and roof safety tethering), neither of which are readily available on site.

The electric and magnetic fields on the mezzanine roof (essentially under a <45-degree cone below the antenna) were found to range between 3-8% and 1-6% occupational MPE, respectively. The highest spatial peak was in the electric field at 15% occupational MPE. Because all measurements were below the 20% occupational MPE threshold, which is the general population threshold, there was no need to perform whole-body average measurements.

Some 7 feet lower in level is the more distant main roof. Both the magnetic and electric field measurements typically hovered at the sensitivity of the instruments, which is about 1%

occupational, and above to about 3%. A spatial peak on the electric field probe of 11% occupational MPE was measured in a gap between some upright steel structures at the far end of the main roof.

A short stepladder was obtained to allow the probes to be raised to just below the roof level of the elevator roof. This ladder is of insufficient height to enable a person to climb onto the elevator roof. The maximum reading was on the electric field probe, at 18% of occupational MPE. This leaves one to assume that field levels *could exceed* 20% occupational MPE (or 100% general population MPE) for a person standing on the elevator roof, closest to the tower.

As the elevator penthouse roof is inaccessible without proper equipment and a roofer safety plan, we will recommend that the building owner and WMBR establish this roof as off-limits unless a site-specific safety work plan involving both RF exposure mitigation and roof worker fall protection is approved for work there. Based on the assumption that there is the potential to exceed the general population MPE, the upper walls of the elevator roof should be marked with blue notice signs per IEEE C95.7 and FCC criteria. Alternatively, if the roof were safely accessed for further testing, measurements could determine whether the elevator roof should be designated, as presently assumed, a controlled environment. If it is shown to be eligible for being an uncontrolled environment, the administrative burden for training and exposure control on that roof would be eliminated.

The tower was also climbed to a point where the spot measurements approached 100% occupational MPE and a climbing threshold location was marked (some 27 feet above the mezzanine roof or 14 feet above the plane of the elevator roof). We will recommend signage and access control measures to prevent unauthorized tower access.

David Maxson, CBRE, WCP
May 24, 2021

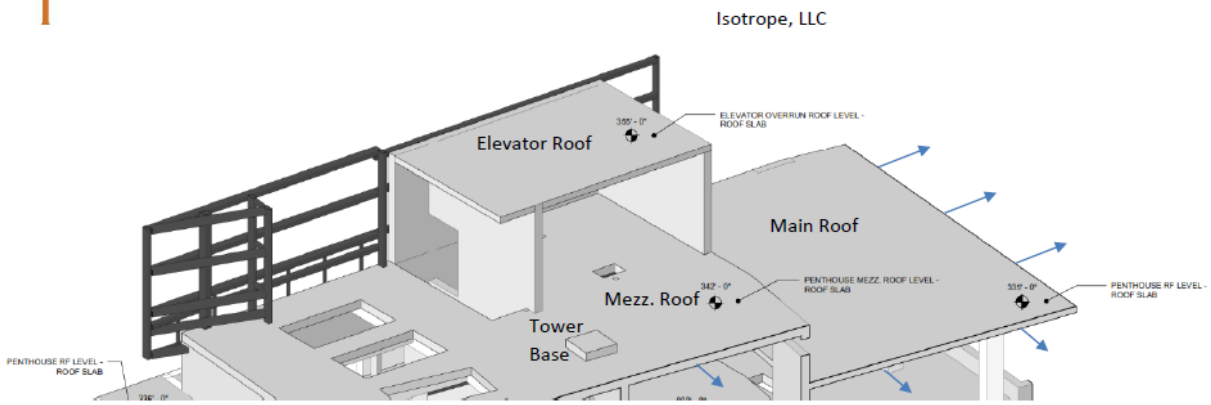

Figure 1 - Cutaway view of roof levels (not complete)

APPENDIX B – Antenna Manufacturer Proof of Performance

Shively Labs®
a division of Howell Laboratories Inc.
P. O. Box 389, 188 Harrison Rd.
Bridgton, Maine 04009 USA
(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 36541
Report of Test 6810-2R-SS-DA
for
Technology BroadcastING Corporation
WMBR-FM 88.1 MHz CAMBRIDGE, MA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-SS-DA to meet the needs of WMBR-FM and to comply with the requirements of the FCC construction permit, file number 0000092534. 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 0000092534 indicates that the Horizontal radiation component shall not exceed 0.640 kW at any azimuth and is restricted to the following values at the azimuths specified:

130 to 160 Degrees True: 0.230 kilowatts

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WMBR-FM
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From Figure 1A, the maximum radiation of the Horizontal component occurs at 320 Degrees True to 325 Degrees True. At the restricted azimuth of 130 to 160 Degrees True the Horizontal component is 9.193 dB down from the maximum of 0.640 kW, or 0.077 kW.

The R.M.S. of the Horizontal component is 0.789. The total Horizontal power gain is 1.300. The R.M.S. of the Vertical component is 0.692. The total Vertical power gain is 1.159. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.845. The R.M.S. of the measured composite pattern is 0.800. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.718. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2R-SS-DA was mounted on a tower of precise scale to the Valmount 24" tower at the WMBR-FM 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 0000092534, a single level of the 6810-2R-SS-DA was set up on the Shively Labs scale model antenna pattern measuring range. A scale of 4.5:1 was used.

EQUIPMENT:

The 4.5:1 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 parabolic dish 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 Hypercell Superflex and Cellflex ICF cabling respectively.

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WMBR-FM
Page Three

The control building is equipped with:

Hewlett Packard Model 4395-A Network Analyzer
PC Based Controller
Output Standard Printer or 'pdf'

All testing is carried out in strict accordance with approved procedures under our ISO9001.

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 396.45 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:

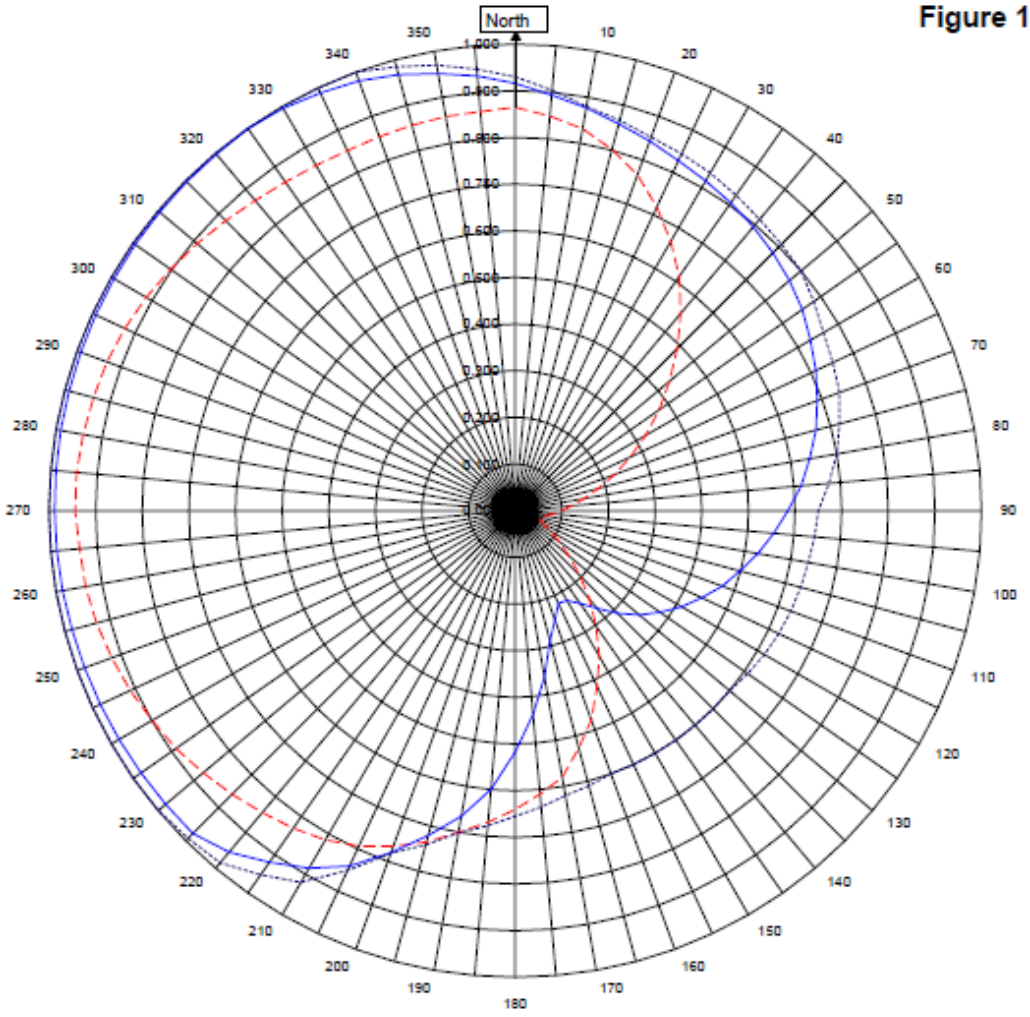
Sean C. Edwards
Director RF Engineering, Shively Labs

S/O 36541
June 26, 2021

Shively Labs

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

Figure 1A



WMBR CAMBRIDGE, MA

36541
June 2, 2020

Horizontal RMS	0.794
Vertical RMS	0.693
H/V Composite RMS	0.806
FCC Composite RMS	0.845

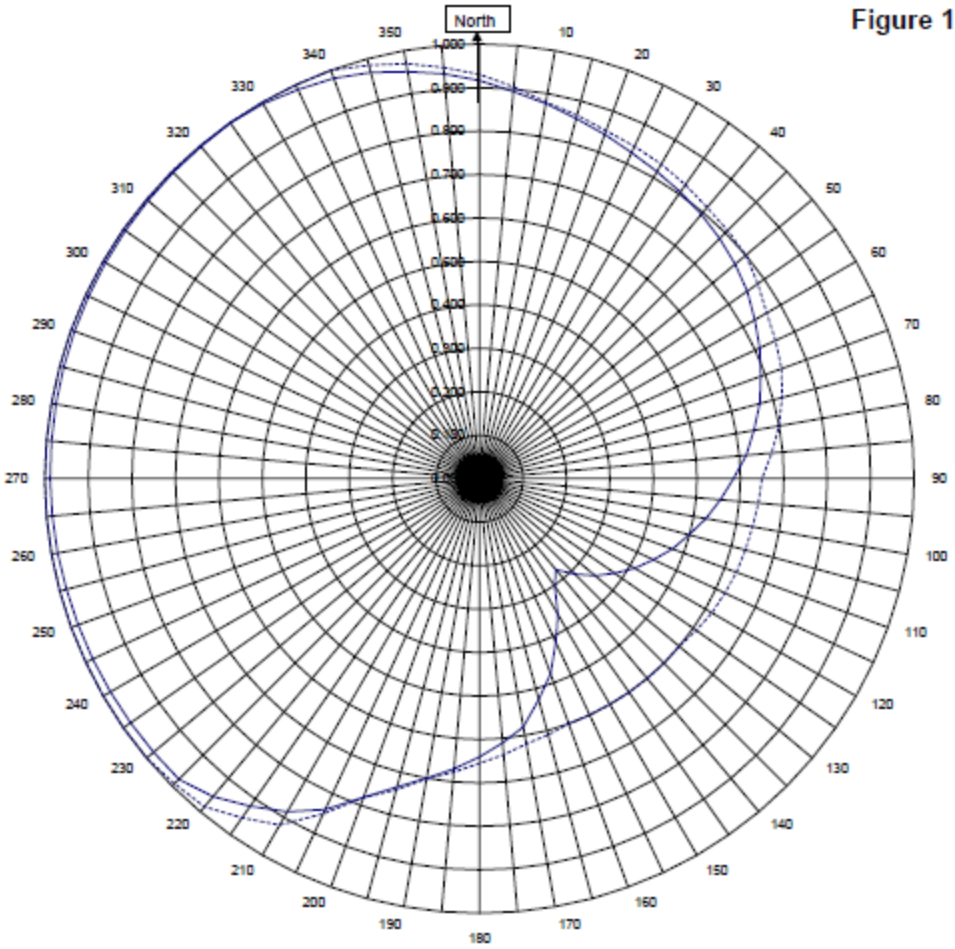
Frequency	88.1 / 396.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS-EF-DA
Pattern Type	Directional Azimuth

Shively Labs

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

Figure 1B



WMBR CAMBRIDGE, MA

36541

June 2, 2020

H/VComposite RMS	0.806
FCC Composite RMS	0.845

Frequency	88.1 / 396.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS-EF-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WMBR CAMBRIDGE, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.916	180	0.517
10	0.877	190	0.665
20	0.843	200	0.780
30	0.816	210	0.885
40	0.794	220	0.955
45	0.782	225	0.978
50	0.768	230	0.979
60	0.731	240	0.981
70	0.689	250	0.983
80	0.641	260	0.986
90	0.584	270	0.988
100	0.529	280	0.990
110	0.473	290	0.992
120	0.412	300	0.994
130	0.347	310	0.996
135	0.311	315	0.997
140	0.273	320	0.998
150	0.222	330	0.996
160	0.249	340	0.981
170	0.361	350	0.951

Figure 1D

Tabulation of Vertical Azimuth Pattern
WMBR CAMBRIDGE, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.865	180	0.640
10	0.831	190	0.700
20	0.766	200	0.765
30	0.666	210	0.815
40	0.552	220	0.844
45	0.491	225	0.859
50	0.431	230	0.874
60	0.322	240	0.899
70	0.226	250	0.921
80	0.149	260	0.936
90	0.099	270	0.944
100	0.067	280	0.941
110	0.056	290	0.932
120	0.086	300	0.914
130	0.150	310	0.891
135	0.195	315	0.879
140	0.247	320	0.868
150	0.360	330	0.855
160	0.477	340	0.853
170	0.580	350	0.858

Figure 1E

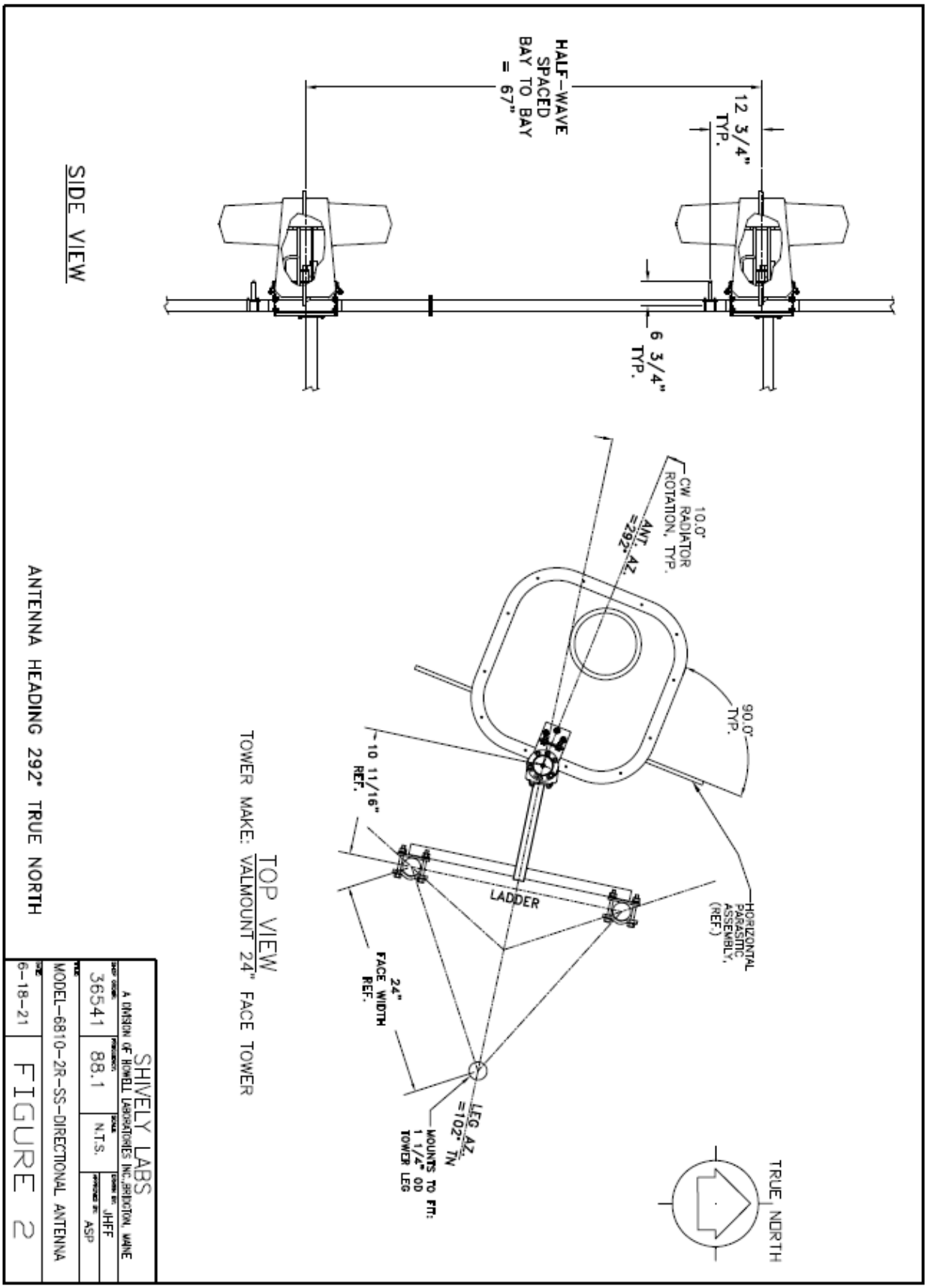
Tabulation of Composite Azimuth Pattern
WMBR CAMBRIDGE, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.916	180	0.640
10	0.877	190	0.700
20	0.843	200	0.780
30	0.816	210	0.885
40	0.794	220	0.955
45	0.782	225	0.978
50	0.768	230	0.979
60	0.731	240	0.981
70	0.689	250	0.983
80	0.641	260	0.986
90	0.584	270	0.988
100	0.529	280	0.990
110	0.473	290	0.992
120	0.412	300	0.994
130	0.347	310	0.996
135	0.311	315	0.997
140	0.273	320	0.998
150	0.360	330	0.996
160	0.477	340	0.981
170	0.580	350	0.951

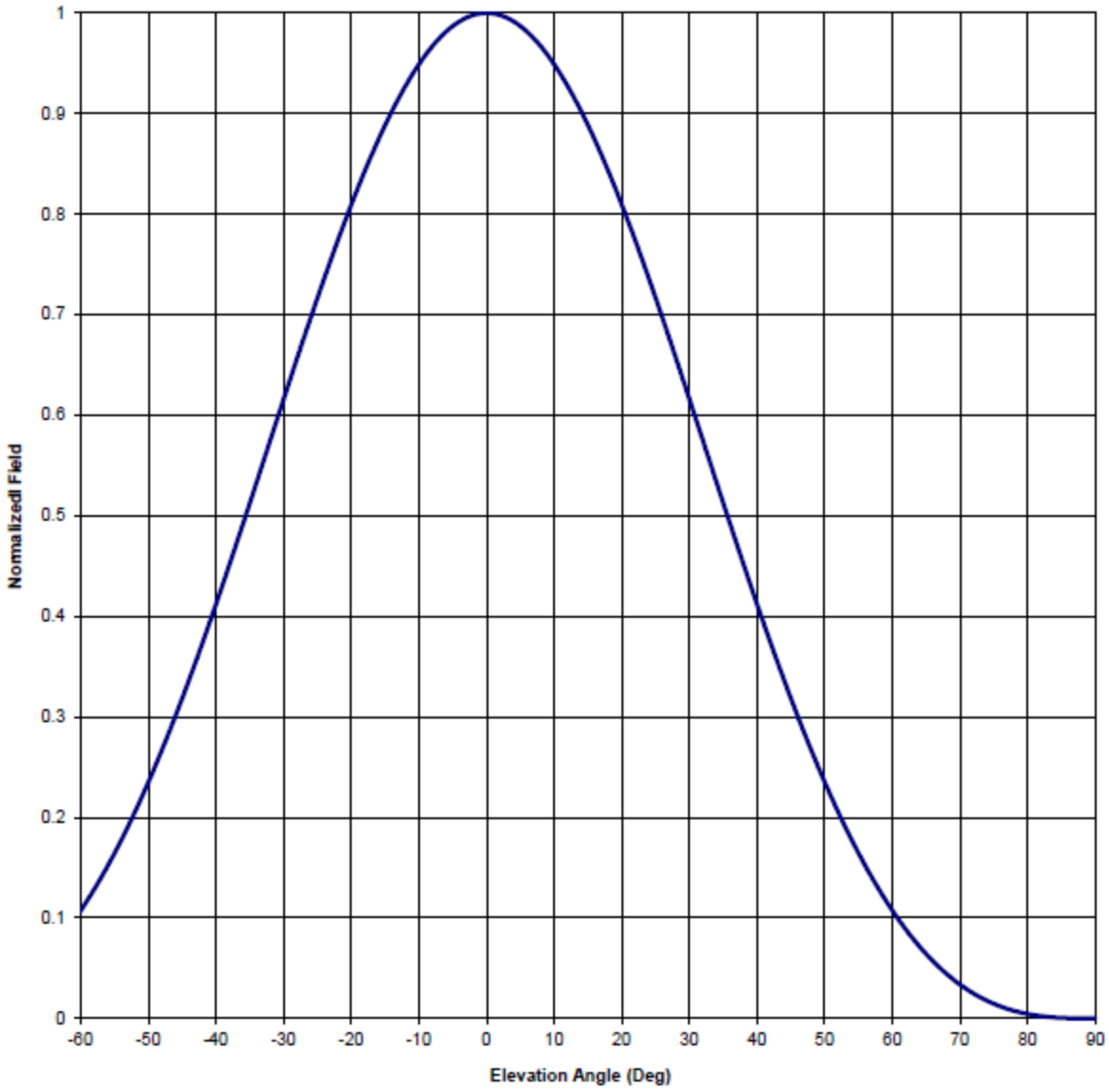
Figure 1F

Tabulation of FCC Directional Composite
WMBR CAMBRIDGE, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.930	180	0.655
10	0.880	190	0.701
20	0.852	200	0.781
30	0.836	210	0.920
40	0.815	220	0.985
50	0.800	230	1.000
60	0.763	240	1.000
70	0.740	250	1.000
80	0.700	260	1.000
90	0.650	270	1.000
100	0.638	280	1.000
110	0.629	290	1.000
120	0.617	300	1.000
130	0.600	310	1.000
140	0.600	320	1.000
150	0.600	330	1.000
160	0.600	340	1.000
170	0.620	350	0.970


SIDE VIEW
HALF-WAVE SPACED BAY TO BAY = 67"
12 3/4" TYP.
6 3/4" TYP.
TOP VIEW
TOWER MAKE: VALMOUNT 24" FACE TOWER
10.0" RADIATOR ROTATION, TYP.
ANT. AZ. =292°
90.0° TYP.
~10 11/16" REF.
LADDER
HORIZONTAL PARASITIC ASSEMBLY, (REF.)
24" FACE WIDTH REF.
LEG AZ. =102° TN
MOUNTS TO FIT: 1 1/4" OD TOWER LEG
TRUE NORTH
ANTENNA HEADING 292° TRUE NORTH
SHIVELY LABS
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE
DRAWING NO. 36541
FREQUENCY 88.1
SCALE N.T.S.
DRAWN BY: JHFF
APPROVED BY: ASP
TITLE MODEL-6810-2R-SS-DIRECTIONAL ANTENNA
DATE 6-18-21
FIGURE 2

Antenna Mfg.:	Shively Labs		Date: 6/8/2020
Antenna Type:	6810-2R-SS-DA		
Station:	WMBR	Beam Tilt	0
Frequency:	88.1	Gain (Max)	1.289 1.103 dB
Channel #:	201	Gain (Horizon)	1.289 1.103 dB
Figure:	Figure 3		



Antenna Mfg.: Shively Labs
Antenna Type: 6810-2R-SS-DA
Station: WMBR
Frequency: 88.1
Channel #: 201
Figure: Figure 3

Date: 6/8/2020

Beam Tilt	0	
Gain (Max)	1.289	1.103 dB
Gain (Horizon)	1.289	1.103 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	0.336	0	1.000	46	0.301
-89	0.000	-43	0.355	1	0.999	47	0.283
-88	0.000	-42	0.373	2	0.998	48	0.267
-87	0.000	-41	0.392	3	0.995	49	0.251
-86	0.000	-40	0.412	4	0.992	50	0.235
-85	0.001	-39	0.432	5	0.987	51	0.220
-84	0.001	-38	0.452	6	0.981	52	0.205
-83	0.002	-37	0.472	7	0.975	53	0.191
-82	0.002	-36	0.492	8	0.967	54	0.177
-81	0.003	-35	0.513	9	0.958	55	0.164
-80	0.004	-34	0.533	10	0.949	56	0.152
-79	0.006	-33	0.554	11	0.939	57	0.140
-78	0.008	-32	0.574	12	0.927	58	0.128
-77	0.010	-31	0.595	13	0.915	59	0.118
-76	0.012	-30	0.616	14	0.902	60	0.107
-75	0.015	-29	0.636	15	0.888	61	0.098
-74	0.018	-28	0.657	16	0.874	62	0.088
-73	0.021	-27	0.677	17	0.859	63	0.080
-72	0.025	-26	0.697	18	0.843	64	0.072
-71	0.029	-25	0.717	19	0.826	65	0.064
-70	0.034	-24	0.736	20	0.809	66	0.057
-69	0.039	-23	0.755	21	0.792	67	0.050
-68	0.044	-22	0.774	22	0.774	68	0.044
-67	0.050	-21	0.792	23	0.755	69	0.039
-66	0.057	-20	0.809	24	0.736	70	0.034
-65	0.064	-19	0.826	25	0.717	71	0.029
-64	0.072	-18	0.843	26	0.697	72	0.025
-63	0.080	-17	0.859	27	0.677	73	0.021
-62	0.088	-16	0.874	28	0.657	74	0.018
-61	0.098	-15	0.888	29	0.636	75	0.015
-60	0.107	-14	0.902	30	0.616	76	0.012
-59	0.118	-13	0.915	31	0.595	77	0.010
-58	0.128	-12	0.927	32	0.574	78	0.008
-57	0.140	-11	0.939	33	0.554	79	0.006
-56	0.152	-10	0.949	34	0.533	80	0.004
-55	0.164	-9	0.958	35	0.513	81	0.003
-54	0.177	-8	0.967	36	0.492	82	0.002
-53	0.191	-7	0.975	37	0.472	83	0.002
-52	0.205	-6	0.981	38	0.452	84	0.001
-51	0.220	-5	0.987	39	0.432	85	0.001
-50	0.235	-4	0.992	40	0.412	86	0.000
-49	0.251	-3	0.995	41	0.392	87	0.000
-48	0.267	-2	0.998	42	0.373	88	0.000
-47	0.283	-1	0.999	43	0.355	89	0.000
-46	0.301	0	1.000	44	0.336	90	0.000
-45	0.318			45	0.318		

S.O. 36541 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WMBR CAMBRIDGE, MA

MODEL 6810-2R-SS-EF-DA

Elevation Gain of Antenna 0.71

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

H RMS 0.794484 V RMS 0.693332 H/V Ratio 1.146

Elevation Gain of Horizontal Component 0.814

Elevation Gain of Vertical Component 0.620

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.584

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.854

Max. Vertical 0.944

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

Total Horizontal Power Gain = **1.289**

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

Total Vertical Power Gain = **1.149**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.64 kW ERP Divided by H Gain 1.289 equals 0.497 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.497 kW Times V Gain 1.149 equals 0.570 kW V ERP

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

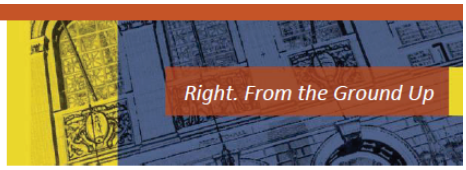
(0.944)^2 Times 0.64 Equals 0.570 kW Vertical ERP

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

Azimuth	Measured H-Pol Relative Field	Measured V-Pol Relative Field	Enveloping Relative Field	Measured H-Pol ERP-DBW	Measured H-Pol ERP-DBW	Enveloping ERP-DBW
N000ºE	0.916	0.865	0.930	27.37	26.80	27.43
N010ºE	0.877	0.831	0.880	26.94	26.45	26.95
N020ºE	0.843	0.766	0.852	26.62	25.75	26.67
N030ºE	0.816	0.666	0.836	26.40	24.53	26.51
N040ºE	0.794	0.552	0.815	26.17	22.90	26.28
N050ºE	0.768	0.431	0.800	25.95	20.75	26.12
N060ºE	0.731	0.322	0.763	25.53	18.22	25.71
N070ºE	0.689	0.226	0.740	25.14	15.14	25.45
N080ºE	0.641	0.149	0.700	24.58	11.53	24.96
N090ºE	0.584	0.099	0.650	23.86	07.97	24.32
N100ºE	0.529	0.067	0.638	23.34	04.58	24.16
N110ºE	0.473	0.056	0.629	22.80	03.03	24.03
N120ºE	0.412	0.086	0.617	22.11	06.75	23.87
N130ºE	0.347	0.150	0.600	21.25	11.58	23.62
N140ºE	0.273	0.247	0.600	20.20	15.92	23.62
N150ºE	0.222	0.360	0.600	19.31	19.19	23.62
N160ºE	0.249	0.477	0.600	19.81	21.63	23.62
N170ºE	0.361	0.580	0.620	21.56	23.33	23.91
N180ºE	0.517	0.640	0.655	23.36	24.19	24.39
N190ºE	0.665	0.700	0.701	24.75	24.96	24.98
N200ºE	0.780	0.765	0.781	25.91	25.74	25.91
N210ºE	0.885	0.815	0.920	27.17	26.28	27.34
N220ºE	0.955	0.844	0.985	27.80	26.59	27.93
N230ºE	0.979	0.874	1.000	27.97	26.89	28.06
N240ºE	0.981	0.899	1.000	27.98	27.14	28.06
N250ºE	0.983	0.921	1.000	27.99	27.35	28.06
N260ºE	0.986	0.936	1.000	28.00	27.49	28.06
N270ºE	0.988	0.944	1.000	28.01	27.56	28.06
N280ºE	0.990	0.941	1.000	28.02	27.53	28.06
N290ºE	0.992	0.932	1.000	28.03	27.45	28.06
N300ºE	0.994	0.914	1.000	28.04	27.28	28.06
N310ºE	0.996	0.891	1.000	28.04	27.06	28.06
N320ºE	0.998	0.868	1.000	28.05	26.83	28.06
N330ºE	0.996	0.855	1.000	28.04	26.70	28.06
N340ºE	0.981	0.853	1.000	27.98	26.68	28.06
N350ºE	0.951	0.858	0.970	27.71	26.73	27.80

APPENDIX C – Antenna Azimuth Survey Certification

FELDMAN



September 30, 2021

Technology Broadcasting Corporation
WMBR-FM Radio
3 Ames St.
Cambridge, MA 02142
ATTN: Brian Sennett

Site Name: **(WMBR Tower at MIT Site 4)**

RE: Installation of Shively 2-bay type 6810 antenna on radio tower at 290 Main St. Cambridge, Middlesex County, Massachusetts.

Mr. Sennett

Feldman Land Surveyors visited the site of the radio tower on September 22, 2021 and found (2) 6810 antennas mounted to the frame of the radio tower. Both antennas are pivoted off the west side of the tower, with the position of the upper antenna to an azimuth of 291°40' and the position of the lower antenna to an azimuth of 292°10'.

Reference:

Facility ID: 64683
Construction Permit File No. 0000092534
Antenna Structure Registration No. 1313623

Damien J. Raffle, PLS (MA# 49629)
draffle@feldmansurveyors.com

9/30/2021
Date

LAND SURVEYING | 3D SCANNING | CONSTRUCTION ENGINEERING | BIM | CONSULTING

Boston Headquarters 152 Hampden Street, Boston, MA 02119 **Worcester** 27 Mechanic Street, Worcester, MA 01608
P 617-357-9740 F 617-357-1829 feldmansurveyors.com

APPENDIX D – Notarized Affidavit from Qualifying Engineer

wmbr **Community radio at MIT**

Technology Broadcasting Corporation
3 Ames St.
Cambridge, MA 02142
(617) 253-4001

I hereby certify the following statements:

I personally supervised the complete installation of a new Shively type 6810 2-bay directional FM broadcast antenna on a 40-foot self-supporting Rohn/Valmont tower for WMBR.

Installation work took place on Thursday, May 6, and Friday, May 7, 2021, and was executed by S&S Tower and Antenna Service. The installation site was on the roof of MIT Building E37 (Site 4 Graduate Residence), 45 Hayward St., Cambridge, MA 02142.

The antenna was side-mounted on the tower and oriented per the manufacturer's instructions in drawing no. S36541-1. The antenna was mounted at the specified height +0 ft./-1 ft. as required to avoid interference with tower members.

There are no other FM, AM, or TV broadcast antennas on this building and I am not aware of any plans to construct such.

There are no antennas of any type currently installed, or planned to be installed to my knowledge, within 5 ft. of either antenna radiator bay, in any direction in the horizontal or vertical plane.

I am the Technical Director and Chief Operator for WMBR. I have been WMBR's Technical Director since 2014 and have been responsible for the maintenance, management, and compliance of our broadcast facilities during that time. I am an electrical engineer by training and profession.

Brian Sennett

May 8, 2021

Technical Director and Chief Operator
WMBR-FM Radio at MIT
tech-director@wmbr.org

APPENDIX E – 47 CFR § 73.313 - Prediction of coverage