

ENGINEERING EXHIBIT

Request for Operation of Superpower Station with Increased Digital Power

prepared for

WGBH Educational Foundation

WGBH(FM) Boston, MA

Facility ID 70510

On behalf of *WGBH Educational Foundation* (“*WEF*”), this statement supports *WEF*’s request to increase the digital power of WGBH(FM) (Ch. 209B, Boston, MA, Facility ID 70510). WGBH is licensed to operate with an effective radiated power (“ERP”) of 100 kW analog at an antenna height above average terrain (“HAAT”) of 198 meters. WGBH’s present hybrid digital operation is at 1 kW ERP, one percent of the licensed analog ERP, using a licensed auxiliary antenna.

WGBH is a so-called “superpower” station in that its licensed analog facility of 100 kW ERP and 198 meters HAAT exceeds the maximum Class B parameters of 50 kW at 150 meters. Pursuant to the Media Bureau’s January 27, 2010 Order in MM Docket 99-325 (DA 10-208), *WEF* seeks to raise WGBH’s digital power to 2.85 kW utilizing a separate antenna. As directed by paragraph 15 of DA 10-208, the maximum digital ERP allowable for WGBH was determined to be 2.85 kW using the calculator¹ on the FCC’s website (results reproduced below).

Exceeds Class B maximum - superpower limitation triggered

WGBH

File No. BLED-19800609AH
BOSTON, MA
Facility ID Number: 70510
Station Class: B
Analog ERP: 100.0000 kW
HAAT: 198.0 meters

Analog class maximum ERP = 28.776 kW, for 198.0 meters HAAT and 60 dBu at 52.2 km distance (Class B reference distance).

Maximum Digital ERP for WGBH is 2.85 kilowatts (10% of the ERP equivalent to Class B reference facilities).

Unrounded Digital ERP = 2.8776

¹ “FM Super-Powered Maximum Digital ERP Calculator” at <http://www.fcc.gov/mb/audio/digitalFMpower.html>

WEF certifies that, with the exception of the digital power level requested, the proposed digital operation will comply with the technical specifications set forth in Appendix B of the First Report and Order in MM Docket 99-325 (FCC 02-286, October 11, 2002).

As with the current 1 kW digital operation, *WEF* proposes use of a licensed auxiliary antenna for the 2.85 kW digital facility (BXLED-20050303ADB). The use of a separate antenna for digital transmission is described in FCC 07-33 (MM Docket 99-325 May 31, 2007) and DA 04-712 (Public Notice March 17, 2004). The auxiliary antenna's HAAT (184 meters) is 93 percent of the HAAT of the main WGBH antenna (198 meters), which is within the 70 to 100 percent height tolerance specified in the March 17, 2004 Public Notice.

The auxiliary antenna is side-mounted on the same tower structure as the main WGBH antenna (ASR number 1006957) and does not involve interleaved antenna elements. There is no difference in the auxiliary antenna's site geographic coordinates from that of the main WGBH facility. The analog WGBH operation will continue to employ an ERP of 100 kW as licensed, and the (average) digital ERP will be 2.85 kW (15.5 dB reduced from the 100 kW analog operation and 10 dB reduced from a conforming Class B facility). See the attached Table 1 for complete engineering data for the WGBH digital and analog operations.

Environmental Considerations – Exposure to Radiofrequency Electromagnetic Field

The proposed operation was evaluated for human exposure to radiofrequency ("RF") energy using the procedures outlined in the Commission's OET Bulletin No. 65 ("OET 65"). The licensed analog facility is considered plus the additional contribution to RF exposure by the proposed digital power increase. The main antenna² system has a radiation center 55 meters above ground level, and consists of 8 antenna bays on a top-mounted mast. The auxiliary antenna (a Shively 6810-3R-SS-PS, for proposed digital use at 2.85 kW ERP) is side-mounted below the main antenna and has a radiation center 37.8 meters above ground level. Both antennas are circularly polarized. Additionally, station WKAF(FM) (Fac ID 19633, Ch. 249A, Brockton, MA, BLH-20090901AHF) is

² The main antenna is a Harris (ERI) model FMH-8AC, with 0.4 degree electrical beamtilt.

licensed to operate on the same tower utilizing 2.05 kW ERP with a Shively 6810-2-SS circularly polarized antenna centered 30 meters above ground level.

Based on OET-65 equation (10), calculated levels of RF electromagnetic field at ground level of attributable to each of these facilities are provided in graphical form in Figures 1 through 3. The graphs indicate each facility's contribution as a percentage of the FCC's general population/uncontrolled maximum permissible exposure ("MPE") limit for locations at ground level at varying distances from the tower structure. Inset plots depict each antenna's elevation relative field pattern, showing specific energy suppression in downward directions. This evaluation considered the theoretical elevation pattern of each transmitting antenna along various depression angles and the corresponding slant distance from the antenna to points two meters above ground level.

The proposed digital operation's contribution to RF exposure is minimal. The attached Figure 1 shows that the maximum RF density level from the proposed digital operation is 3.3 percent of the uncontrolled/general population MPE limit at any location two meters above ground level, which occurs at a distance of 98 meters horizontally distant from the base of the tower structure.

Similar graphs are provided for the WGBH analog facility (Figure 2) and WKAF (Figure 3). The analog WGBH operation is a much more significant contributor to RF electromagnetic field. The maximum calculated RF electromagnetic field at two meters above ground level from the analog WGBH facility is 88.5 percent of the uncontrolled/general population MPE exposure limit, occurring 12 meters horizontally from the tower base. WKAF's maximum contribution is 8.3 percent of the uncontrolled/general population MPE exposure limit and occurs at 49 meters horizontally from the tower base.

Figure 4 provides a composite graph of calculated RF electromagnetic field attributable to all three facilities (individually and totaled) at locations two meters above ground level near the transmitter site. When summed, RF electromagnetic field attributable to the WGBH analog, WGBH proposed digital, and WKAF facilities reach a maximum of 89.6 percent of the uncontrolled/general

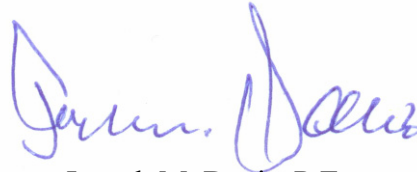
population MPE limit at any location two meters above ground level. This occurs at a distance of 13 meters horizontally distant from the base of the tower structure. When the actual terrain elevations are considered (which are generally lower since the tower is on a hilltop), the calculated RF electromagnetic field will be even lower.

A slight terrain rise (5.5 meters above the elevation of the tower base) occurs at a distance of 50 meters horizontally from the WGBH tower, according to representatives of the applicant. Additionally, a weather observation platform associated with the Blue Hill Observatory and Science Center is approximately 14.6 meters higher than the base of the tower at a distance of 40 meters horizontally from the WGBH tower. These locations are sufficiently removed from the point of maximum calculated RF electromagnetic field that the field will be lower. Detailed calculations using the techniques described above show that the calculated RF electromagnetic field attributable to the WGBH analog, WGBH proposed digital, and WKAF facilities at two meters above the top of the terrain rise is 21.3 percent of the uncontrolled/general population MPE limit, and 42.9 percent of the uncontrolled/general population MPE limit at a point two meters above the weather observation platform.

No other authorized FM, AM, or TV stations are located within 3 km of WGBH, according to data extracted from the FCC's database. As demonstrated herein, excessive levels of RF energy attributable to the proposed facility will not be caused at publicly accessible areas at ground level near the antenna supporting structure or on the weather observation platform. The applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from RF electromagnetic field exposure in excess of FCC guidelines.

Certification

The undersigned hereby certifies that the foregoing statement and associated attachments were prepared by him or under his direction, and that they are true and correct to the best of his knowledge and belief.



Joseph M. Davis, P.E.
January 31, 2011

Chesapeake RF Consultants, LLC
207 Old Dominion Road
Yorktown, VA 23692
703-650-9600

List of Attachments

Table 1	Engineering Data - Increased Digital Power
Figure 1	Proposed Digital Antenna Calculated RF Electromagnetic Field
Figure 2	Licensed Analog Antenna Calculated RF Electromagnetic Field
Figure 3	WKAF(FM) Brockton, MA Calculated RF Electromagnetic Field
Figure 4	Total WGBH and WKAF Calculated RF Electromagnetic Field

Table 1
Engineering Data - Increased Digital Power
prepared for
WGBH Educational Foundation
WGBH(FM) Boston, MA

Technical Contact: Dennis Correia (781) 354-0622

Proposed Digital ERP: 2.85 kW
15.5 dB reduced from WGBH licensed 100 kW analog
10 dB reduced from a conforming Class B facility (28.5 kW)

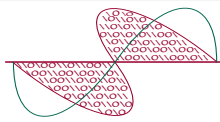
Type of Digital Operation: Dual (Separate) Antenna, non interleaved

Digital and Analog Data

Description	Licensed Analog Operation Main Antenna	Proposed Digital Operation Auxiliary Antenna
File Number	BLED-19800609AH	BXLED-20050303ADB
Site Coordinates (NAD-27)	N-Lat 42° 12' 42" W-Lon 71° 06' 51"	N-Lat 42° 12' 42" W-Lon 71° 06' 51"
Antenna Structure Registration	1006957	1006957
Antenna Radiation Center Height		
Above ground	55 m	37.8 m
Above mean sea level	242 m	225.6 m
Above average terrain	198 m	183.8 m (93% of main)
Antenna type	Non-directional	Non-directional
Effective Radiated Power	100 kW (no change)	2.85 kW
Transmitter Power Output	23.5 kW (no change)	2.89 kW

Detailed Summary of Digital TPO Calculation

Digital Effective Radiated Power (avg):		2.85 kW
<u>Auxiliary Antenna System</u>		
Shively 6810-3R-SS-PS	Power Gain:	1.02
3 sections 1/2 wave spaced	Antenna Input Power:	2.79 kW
<u>Line and Other Losses</u>		
Transmission Line	Efficiency:	96.8 percent
Dielectric Flexline 3 1/8 inch 50 Ohm, Length 125 ft		
Other losses: none		
Required Digital Transmitter Power Output (avg):		2.89 kW



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Radiofrequency Consulting Engineers
Digital Television and Radio

Graph depicts calculated percentage of General Population/Uncontrolled Maximum Exposure Limit attributable to facility for locations 2 meters above ground (assuming level terrain). Calculations conducted pursuant to FCC OET Bulletin Number 65.

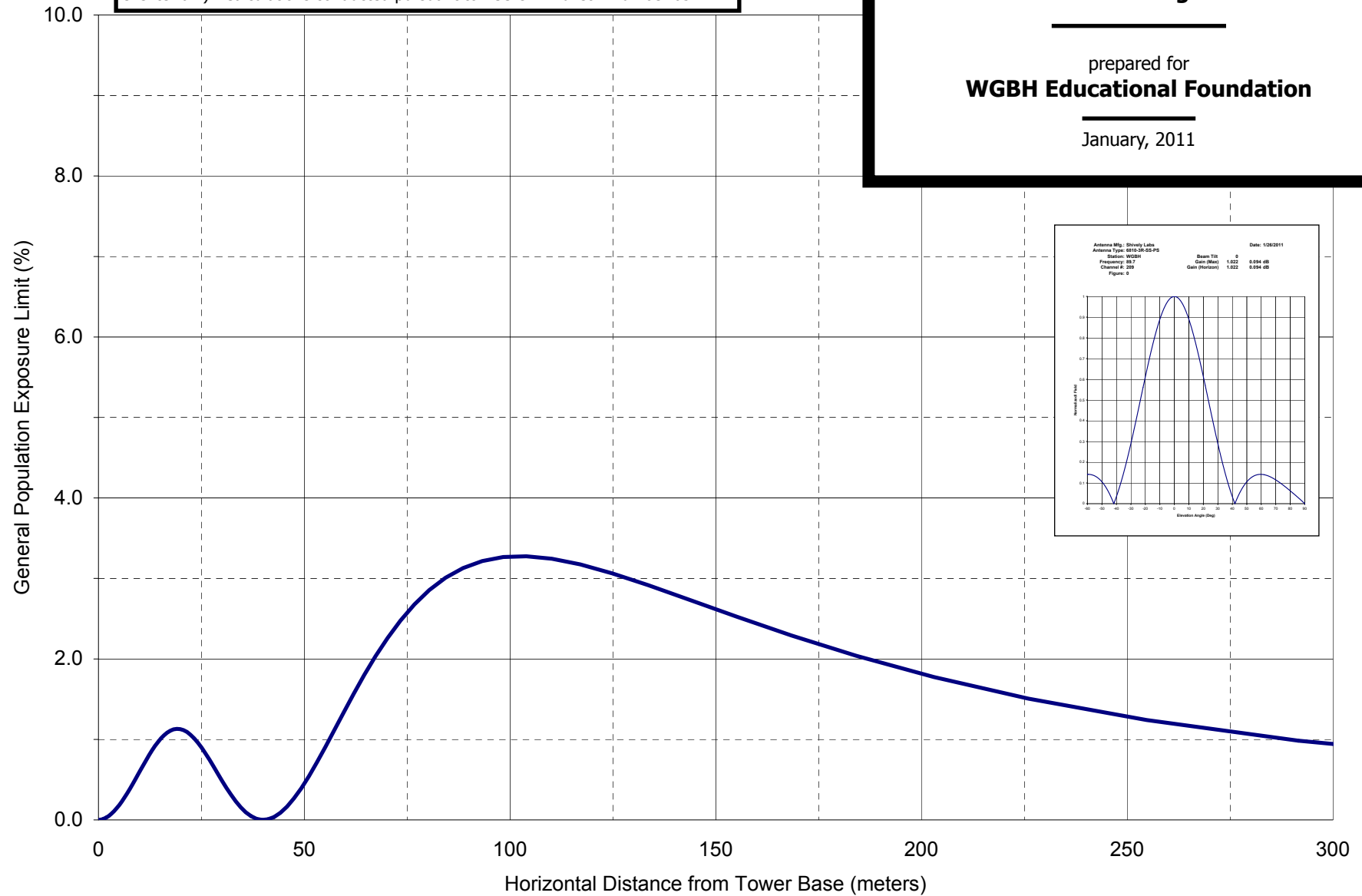
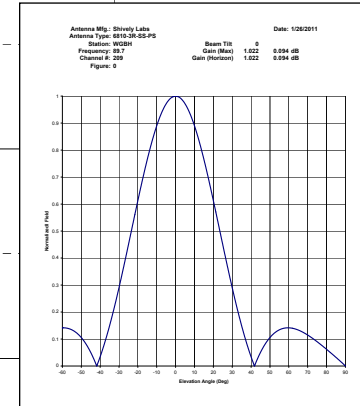
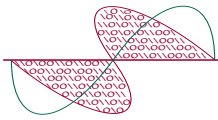


Figure 1
Calculated RF Electromagnetic Field
Attributable to Proposed Digital Operation
WGBH(FM) Boston, MA
2.85 kW Digital

prepared for
WGBH Educational Foundation

January, 2011





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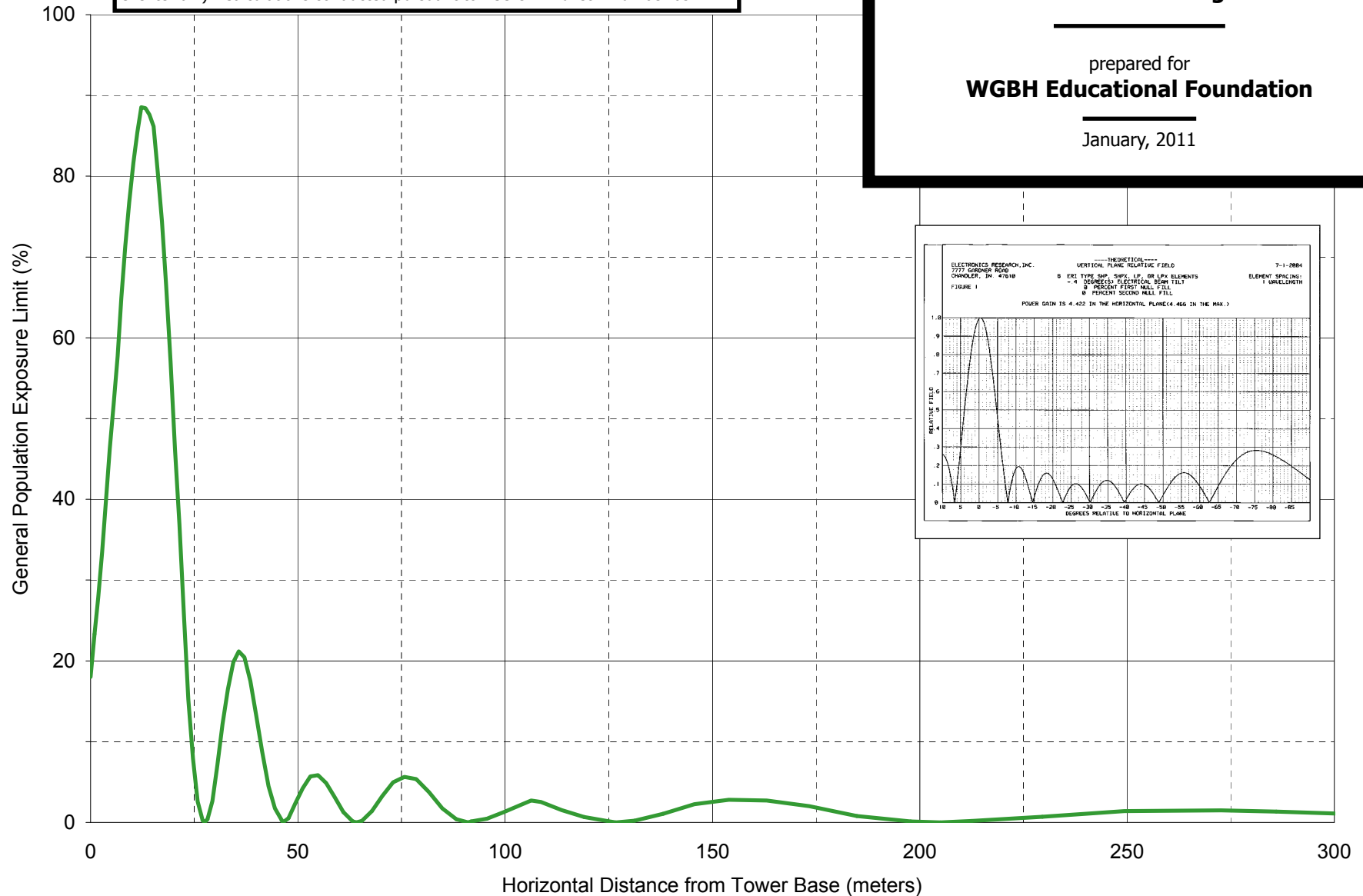
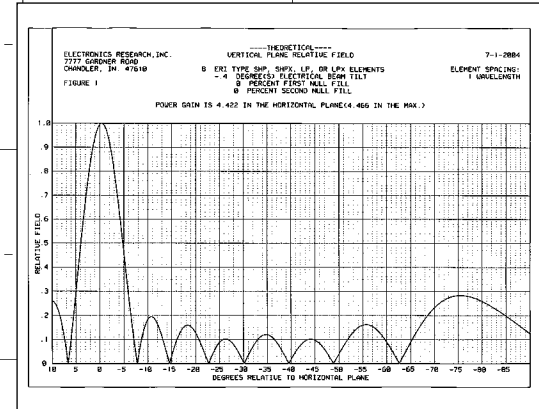
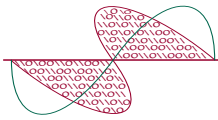


Figure 2
Calculated RF Electromagnetic Field
Attributable to Licensed Analog Facility
WGBH(FM) Boston, MA
100 kW Analog

prepared for
WGBH Educational Foundation

January, 2011





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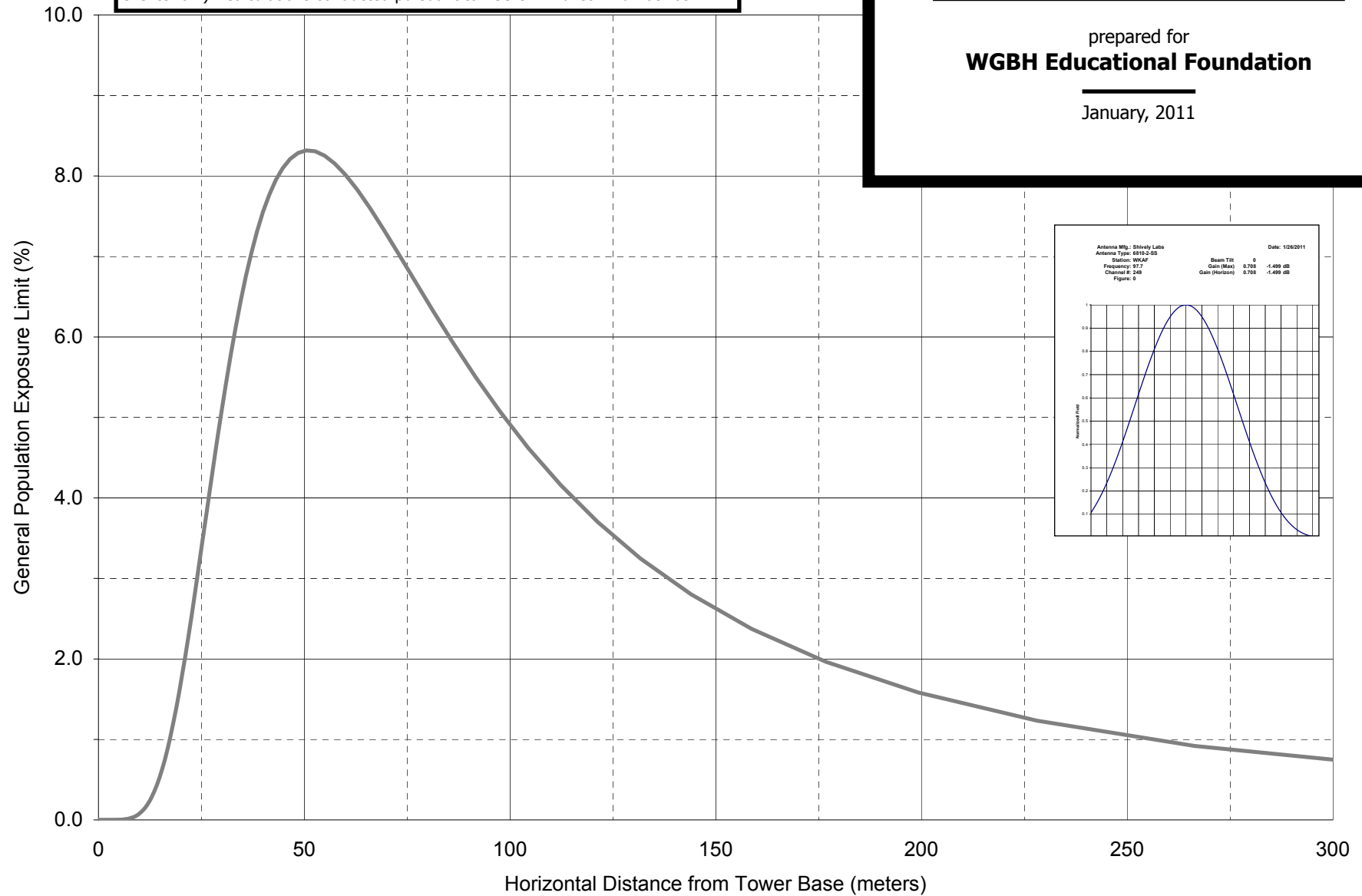
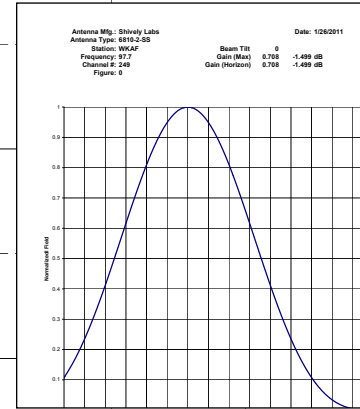
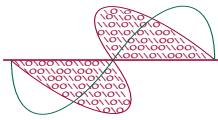


Figure 3
Calculated RF Electromagnetic Field
Attributable to WKAF(FM) Brockton, MA
Lic BLH-20090901AHF 2.05 kW ERP

prepared for
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Graph depicts calculated percentage of General Population/Uncontrolled Maximum Exposure Limit attributable to facility for locations 2 meters above ground (assuming level terrain). Calculations conducted pursuant to FCC OET Bulletin Number 65.

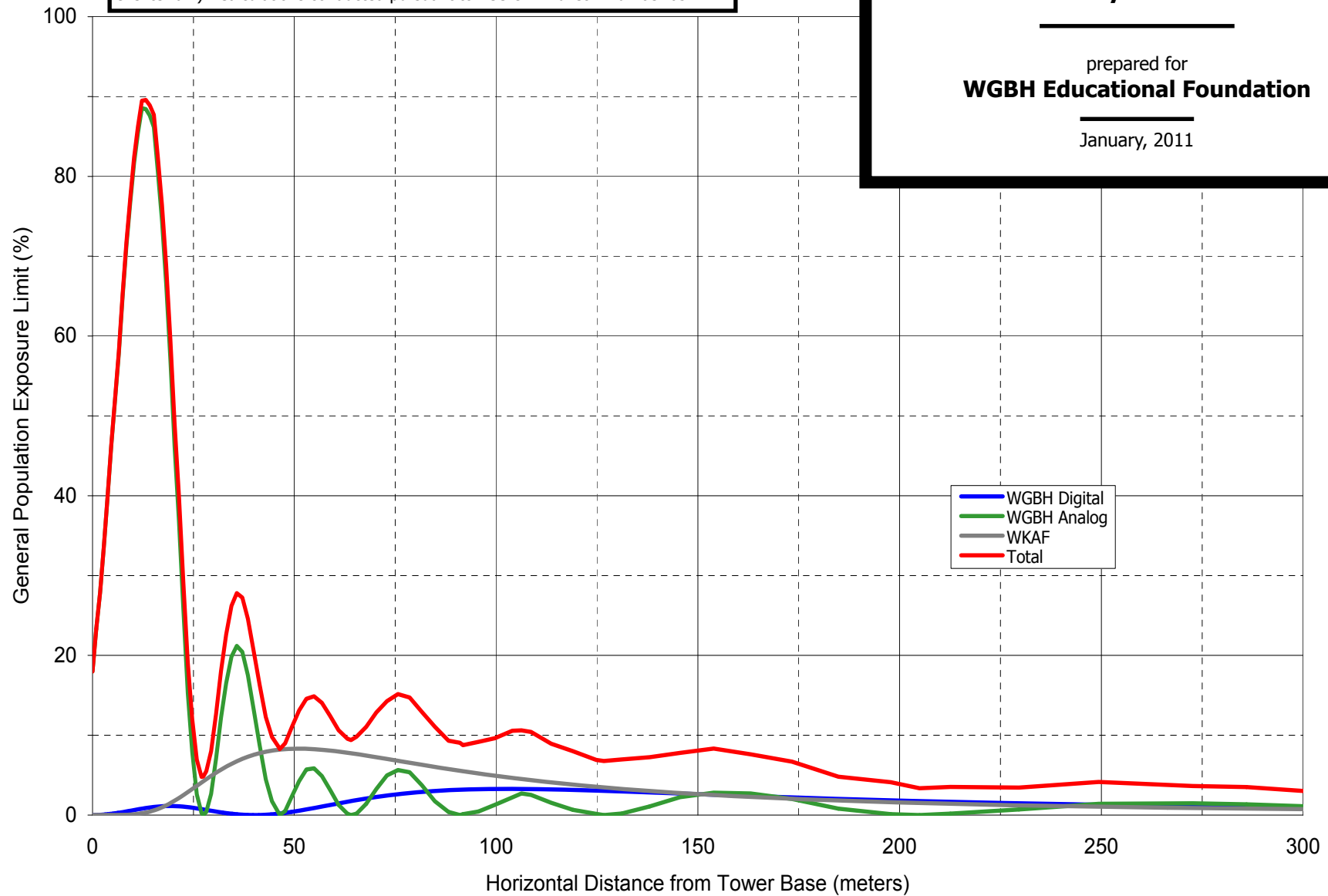


Figure 4
Calculated RF Electromagnetic Field
Total of WGBH and WKAF
WGBH(FM) Boston, MA
Facility ID 70510

prepared for
WGBH Educational Foundation

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